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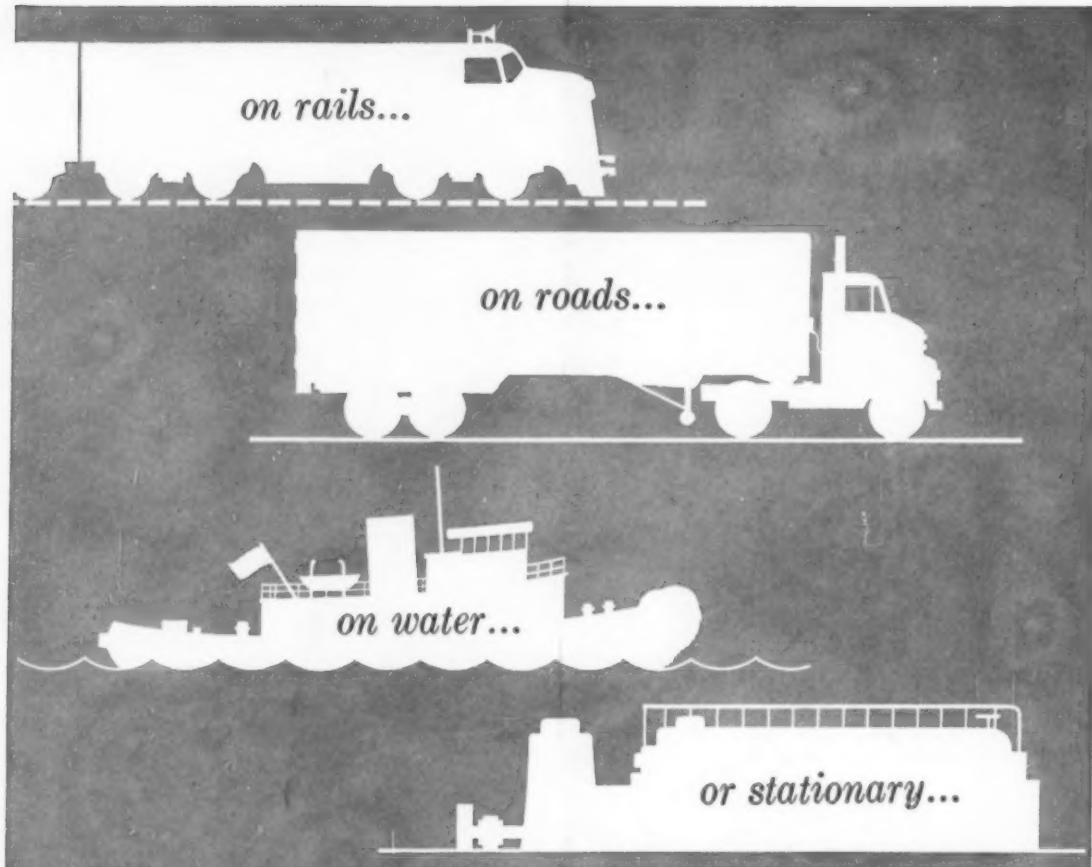
DIESEL AND GAS ENGINE PROGRESS



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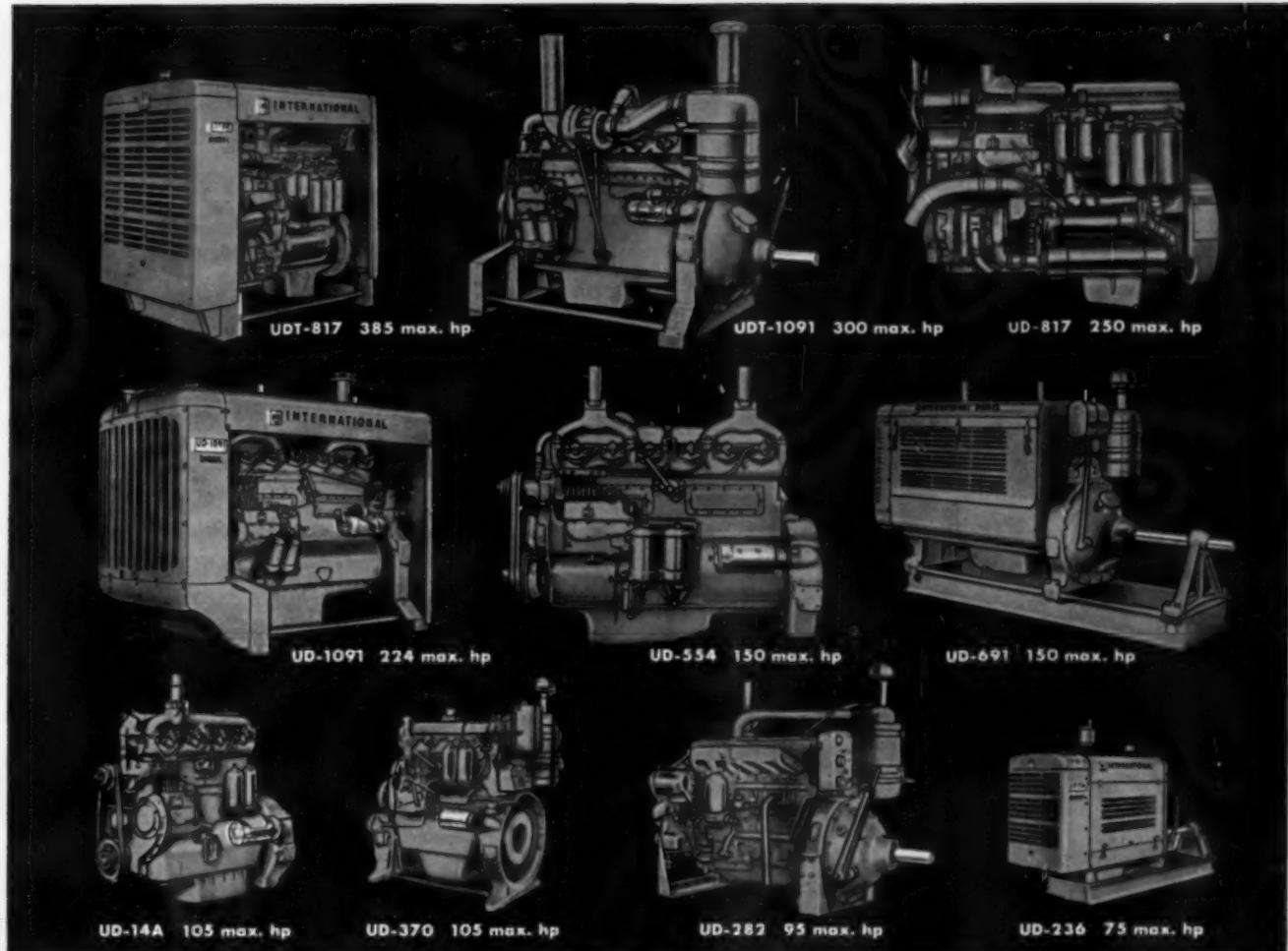
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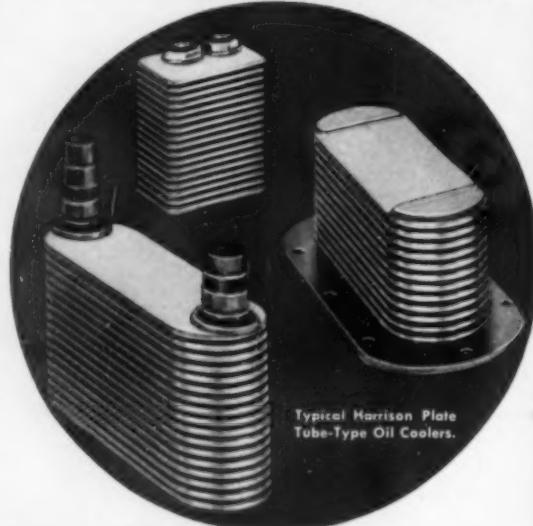
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DIESEL GAS ENGINE PROGRESS

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DIESEL AND GAS ENGINE PROGRESS for February, 1961, Vol. XXVII, No. 2. Published Monthly by Diesel Engines, Inc., 1701 W. Wisconsin Ave., Milwaukee 3, Wisc. Phone Division 4-5355. Subscription rates are \$3.00 for U.S.A. and possessions. All other countries \$7.50 per year. Subscriptions may be paid the London Office at £2-12s-6d per year.

DIESEL AND GAS ENGINE PROGRESS is indexed regularly by Engineering Index, Inc. and is available in microfilm editions from University Microfilms, Inc., Ann Arbor, Michigan.

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When model 3480TD Mack® power through all plate on New York State Thruway. For a story on cooperative research into tractor-engine economy, see page 22.





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Koppers supplies packaged piston ring set for Caterpillar's husky D8 crawler Tractor

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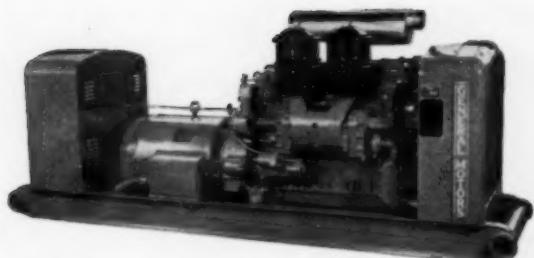
Write today for complete information to: KOPPERS COMPANY, INC., Piston and Sealing Ring Dept., 6202 Hamburg St., Baltimore 3, Md.

That's a completely Koppers ring equipped piston you're looking at. From the precision lapped, chromium plated, high strength alloyed iron compression ring in its top groove to the chromium plated, conformable, spring loaded, ventilated oil ring in the bottom groove. This set-up guarantees fast break-in and longer life resulting in peak efficiency for Caterpillar's 235 HP diesel engine.

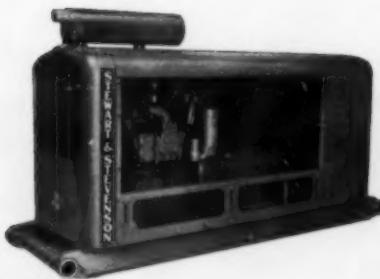


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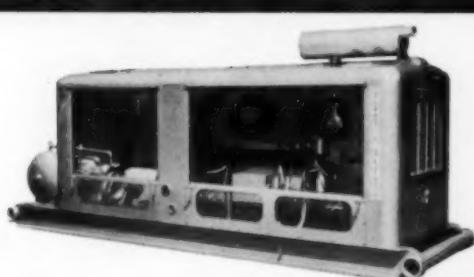


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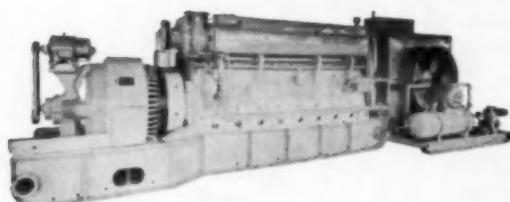
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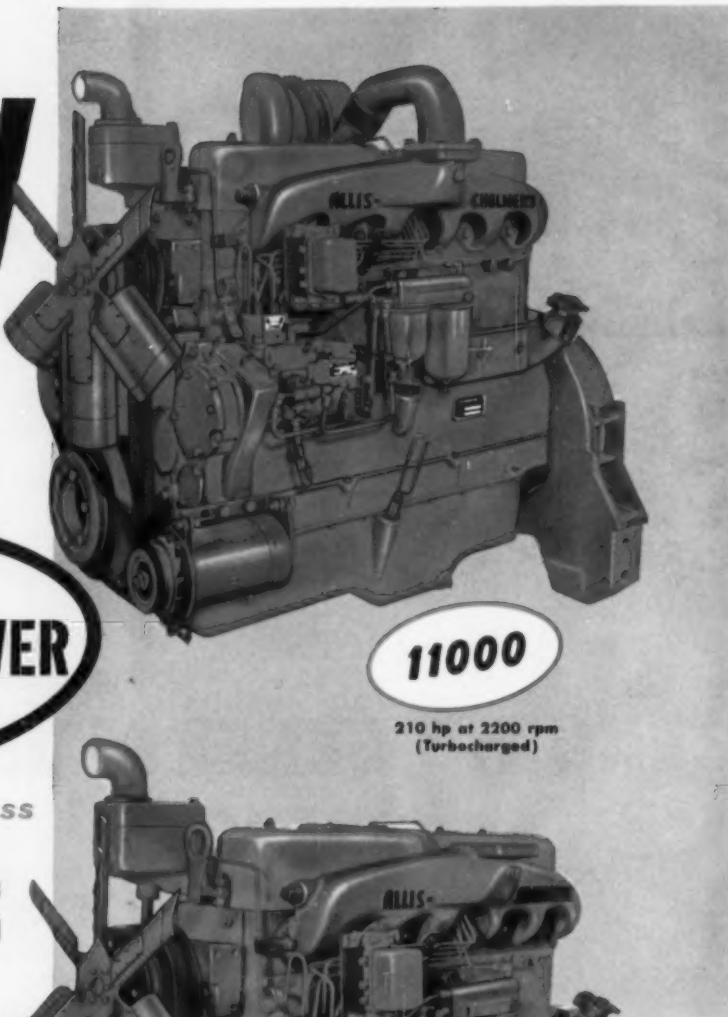
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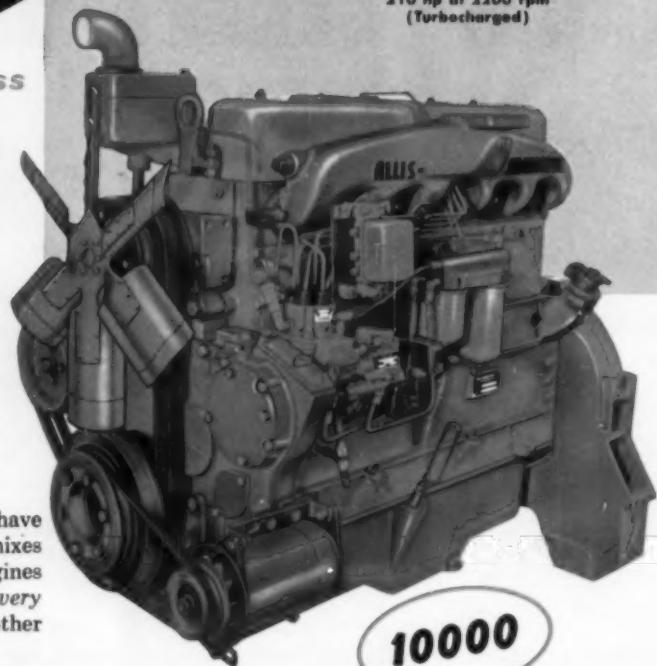
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11000

210 hp at 2200 rpm
(Turbocharged)



10000

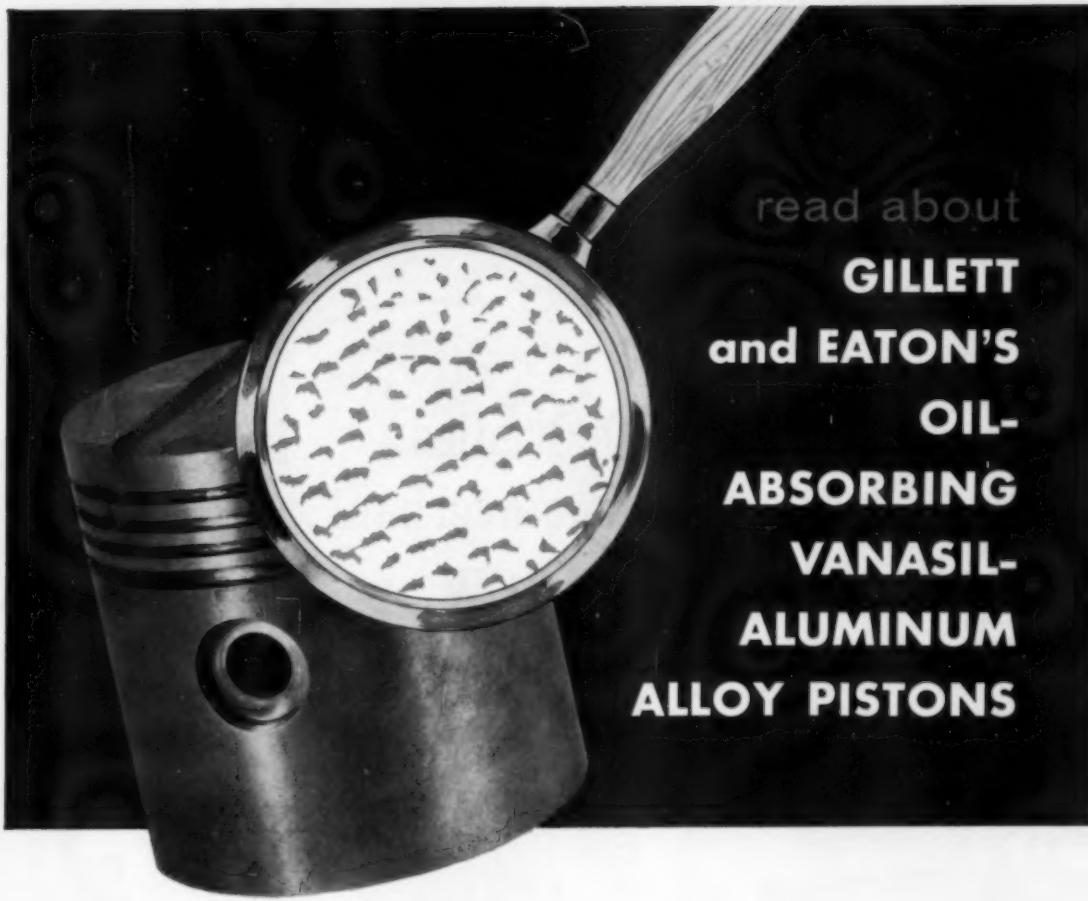
145 hp at 2200 rpm

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METALLURGISTS have tested piston metals from strong (but heavy) iron to light (but soft) aluminum. From all the alloys in between, they have found only one with all the properties ideal for pistons.

This one unique alloy combines the strength of iron and the lightness of aluminum. Oil absorbing Vanasil, is a Hyper-eutectic silicon aluminum alloy, and is manufactured exclusively by Gillett & Eaton, Inc.

A high silicon-to-aluminum ratio is precisely maintained to make Vanasil 30% harder than ordinary piston aluminum, and in addition increases "hot strength". Diesel trucks have repeatedly run over 200,000 miles with under .005" wear in the top ring groove of Vansil pistons—reducing wear up to 75% at this vital point.

When Vanasil solidifies in casting, the molecular structure changes into hard, inter-locking crystals. It becomes amazingly porous. In operation, the microscopic pores absorb oil from the fuel or lubrication system.

Saturated with oil, lubricity of the pistons is increased so that they require less energy and fuel to deliver full rated power. Should the lubrication system fail, Vanasil pistons retain enough oil to bring the engine to a safe stop.

Light weight and the increased freedom from friction of oil-absorbing Vansil pistons has in many cases increased engine power up to 25%. Why not find out if these long-wearing pistons can increase the performance of your engines? Write for specifications and test data.

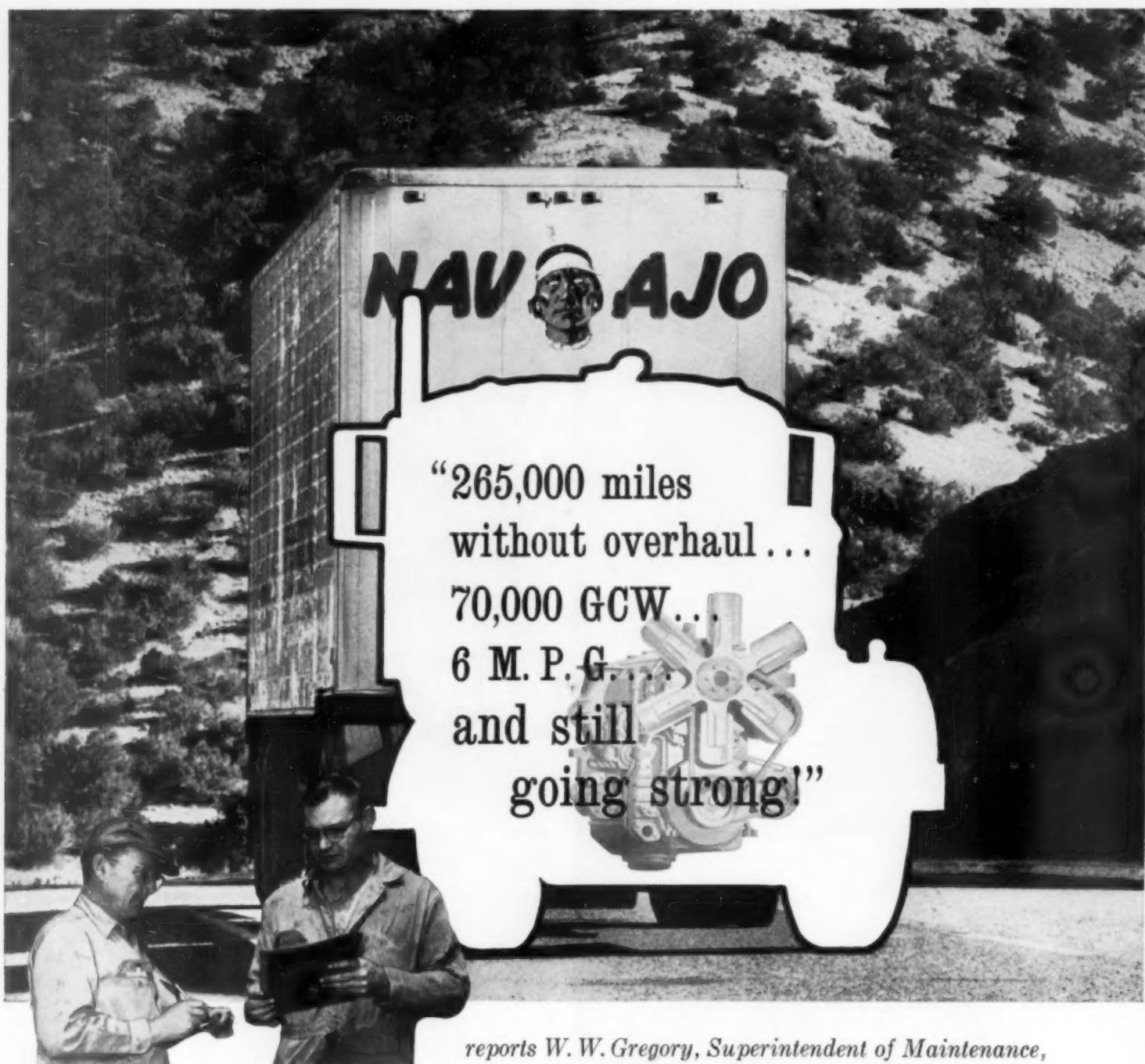
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W. W. Gregory, (left) Superintendent of Maintenance, Navajo Freight Lines, Inc., and his assistant, Jim Brown.

When you haul up to 70,000 lbs. GCW on tough cross-country runs—get up to 6 miles per gallon—and are still going strong after 265,000 miles without overhaul—that's profitable performance!

And that's the kind of performance W. W. Gregory, Superintendent of Maintenance of Navajo Freight Lines, Inc., reports on his oldest "6-71" powered rig. And he has the facts to prove it.

For Mr. Gregory checks his truck performance trip by trip, day by day, month by month—knows exactly what kind of records his Diesels are turning in.

Navajo got their first "6-71" Diesel-powered rig in 1958. Now the company uses these economical engines to power three different makes of trucks and currently have several more on order.

If you're not satisfied with the mileage you're

getting—per gallon, between overhauls, or both—why not take a look at a Series 53 or 71 truck model of the All-Purpose Power Line? You'll find there's a "V" or "in-line" model to power virtually any truck in your fleet.

When you're in the market for new trucks, be sure and ask for Series 71 Diesel Power. And if you are re-powering your present equipment, see your GM Diesel distributor—he's part of a coast-to-coast network of "engine people" you'll find in the Yellow Pages under "Engines, Diesel"—or write for your copy of the 8-page book describing Series 53 and 71 truck models of the All-Purpose Power Line.

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GENERAL MOTORS, DETROIT 28, MICHIGAN

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SERIES 53

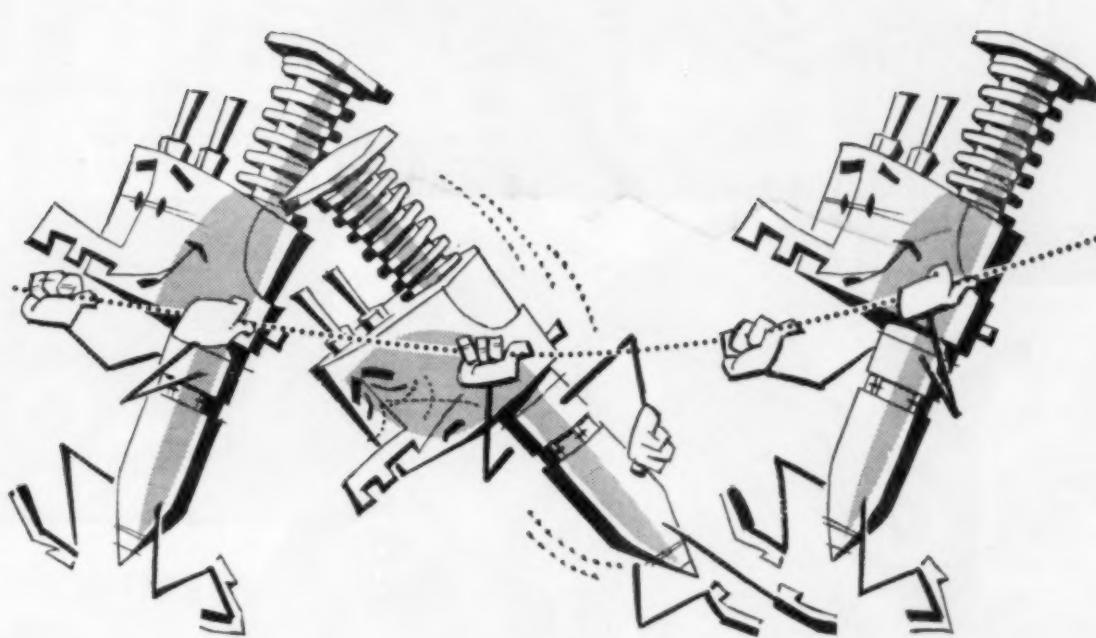
"V" and "in-line" engines
97 to 185 H.P.



SERIES 71

"V" and "in-line" engines
145 to 434 H.P.

DIESEL AND GAS ENGINE PROGRESS



Who's dragging his feet?

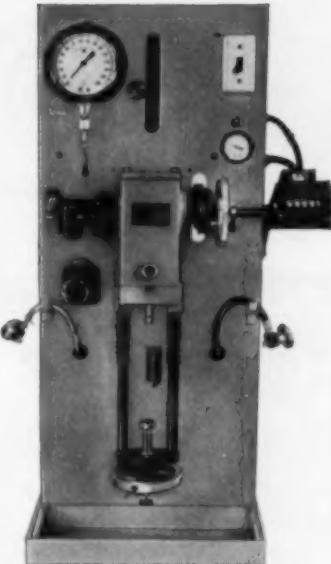
Visual inspection won't tell you which fuel injector is causing a once smooth, powerful Diesel to lose power, waste fuel, and run like a one-legged miler on a broken crutch.

But a Kent-Moore Injector Comparator can tell you—and in a matter of minutes.

How?

By testing the fuel flow capacities of *all* the injectors. And indicating which one is guilty of delivering too much or too little fuel to its cylinder at a given throttle setting.

Manufacturer's maintenance manuals tell how to use the Injector Comparator. Follow the factory recommended procedure for higher performance standards and better operating economy by matching the fuel flow characteristics of the unit-type injectors in your engine, through replacement or rebuilding with factory-approved parts.



J8686 Injector Comparator



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H4



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AiResearch T-6 turbocharger (weighs 24 lb, 7 3/4 in. diameter)

Economical turbocharging of **Caterpillar's 130hp D320 engine**

Economical turbocharging of Caterpillar's small, versatile D320 engine with AiResearch's T-6 turbocharger results in a highly efficient engine that is lower in original cost, more economical in operation and smaller in size than a naturally aspirated engine of the same horsepower.

The turbocharging of this economical power unit was developed jointly by AiResearch and the Caterpillar Engine Division. Integration of the turbocharger and engine is economical because of the turbocharger's simplified design and low cost. The turbocharger design incorporates a free vortex housing, elimin-

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AiResearch is a world leader in the development and manufacture of high performance, low cost turbochargers and turbocharger controls for internal combustion engines ranging from 50 to 700 hp.

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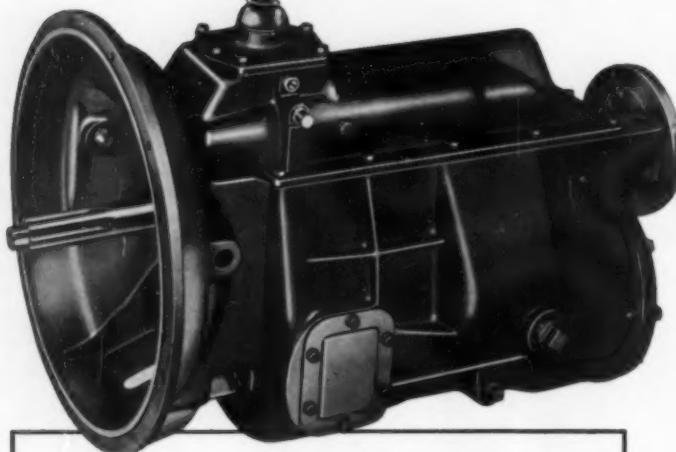
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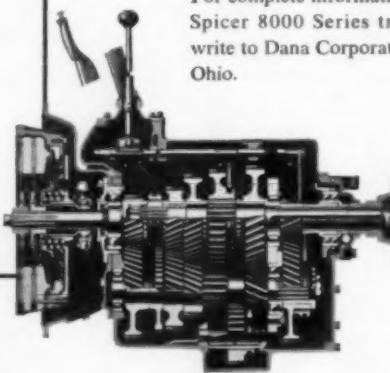
RANGE	STANDARD MODELS 8052 and 8054	OPTIONAL MODELS 8052-A and 8054-A
1st	7.30 to 1	5.68 to 1
2nd	4.54 to 1	3.13 to 1
3rd	2.75 to 1	1.71 to 1
4th	1.65 to 1	1.29 to 1
5th	1.00 to 1 (direct)	1.00 to 1 (direct)
Reverse	7.00 to 1	5.47 to 1

NOTE: The 8031 and 8035 Series Spicer auxiliary transmissions have been augmented by a new underdrive ratio of 1.19 to 1 to better complement the ratios of the new Series 8000 direct-on-fifth transmissions.

Here is the extra-heavy-duty transmission that truck fleet operators have demanded! The new Spicer 8000 Series 5-speed transmission is the largest capacity direct-on-fifth transmission on the market. It is designed primarily to complement big diesel engines.

With the new 8000 Series Spicer transmission, top vehicle speed is obtained in direct drive. Ratios of the new transmission are spaced so that they are functionally split or compounded with ratios of 2- and 3-speed axles and 3- and 4-speed auxiliary transmissions. Spicer 14" 2-plate and 15½" 2-plate clutches are matched to work at top efficiency with this new 8000 Series unit.

For complete information on the new Spicer 8000 Series transmissions, write to Dana Corporation, Toledo 1, Ohio.



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635 HP Engine-Compressor Package in service pumping gas for Liberty Gas Transmission Company, Hull, Texas. This unit is a matched combination of Superior 8G-825 gas engine and White W-64 four cylinder compressor.

White-Superior *matched design* ENGINE-COMPRESSORS

White Diesel announces a line of medium speed, heavy duty, balanced opposed compressors, 200 to 1000 BHP, specifically engineered for combination with Superior natural gas engines. The complete, compact, *matched design* engine-compressor package provides continuous, heavy duty service for gas gathering, gas lifting, repressuring and booster applications.

Six inch stroke White compressors coupled to 9 inch and 10½ inch stroke Superior oil field gas engines provide optimum combinations of piston speed, horsepower and service life. Model W-62, two-cylinder compressor, ranges from 200 BHP with Superior 6G-510 gas engine

to 635 BHP with 8G-825. Model W-64, four-cylinder compressor, is rated up to 1000 BHP with supercharged 8GX-825 gas engine. Standard cylinder sizes range from 4000 PSI, 2½" dia. to 85 PSI, 22½" dia., providing 68 different cylinders. Custom sizes and designs available.

Speed of direct-connected engines (no belts or gears) can be varied from 600 to 900 RPM for easy control of compressor unit. Compressor cylinders can be easily changed on same frame to suit changing volume or pressure conditions.

Get new Bulletin 124 from White oil field representatives . . . or write today to:



White Diesel
WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

Manual Loading Panels

Masoncian manual loading panels, for remote manual control of pneumatically-operated valves, cylinders and other devices, are described in a new folder. Specifications are given for two units: model 140-1, a moderately priced unit for reduced pressure ranges of 0-to-40 or 0-to-100 psi, and model 141-1, for

installations requiring more precise regulation, with ranges of 0-to-30, 0-to-50 or 0-to-100 psi. Either model is offered with a 2½ in. gauge of approximate range; either may have a three-way switch added for rapid loading or exhaust. To obtain copies of the folder write Mason-Nelan, Division of Worthington Corp., Norwood, Mass.

[ITS NEW]

New Tournattractor

LeTourneau-Westinghouse Company has announced a new model C Tournattractor with hydraulically operated attachments as a companion unit to the current C Tournattractor with electrical controls. The new unit will differ from the present Tournattractor in many ways—and from other tractors with hy-

draulics as well. The new LW machine will utilize a high pressure hydraulic system of 5,000 PSI. Instead of the usual vane or gear type, this unit is using a direct drive, Dynex piston pump. This new C Tractor is powered by a new GM 6V-71 engine, producing 218 hp. The transmission is the LW power-shift type, air actuated with torque converter, 4 speeds forward, and a top speed of 18.5 mph.

[ITS NEW]



HEAVY-DUTY OIL RING WITH TRI-COIL OFFSET SPRING

solves tough oil control problems—
and only Perfect Circle has it!

Exclusive new Perfect Circle tri-coil spring has maximum area of contact with the ring all the way around—provides more uniform pressure than an ordinary hump-type expander. This results in higher cylinder conformability with less friction.

And, the stainless steel spring is offset in a channel next to the ring slots, rather than being directly behind them. Ventilation is greatly increased, and clogging of the ring and spring is reduced to a minimum.

Heat stability and easy installation are two more of the many more outstanding features of the new Perfect Circle OS 89. Get complete information from your Perfect Circle representative today!

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Don Mills, Ontario, Canada



Single Case Recorder— Controller

The Bristol Co. is now offering a single-case time-program recorder-controller in its Series 500 instrument line. Incorporation of the recorder and the controller into a single unit affords a 50 per cent reduction in panel-space requirements. The recorder chart and the program can are independently driven. This makes it possible to record repetitions of the program on a single chart. The program time may be from 30 minutes to 30 days. Various models of the instrument measure and control temperature, pressure (including absolute pressure), flow (mercury manometer or bellows-differential meter), liquid level, and humidity. Either pneumatic control or Bristol's Free-Vane electronic control is offered. Pneumatic control can be "on-off," or proportional or reset control. An external manual-automatic station is available.

[ITS NEW]

Universal Band Clamp

Marman Universal band clamps for replacement of all hose connections on water lines, air cleaning lines and manifold lines on diesels are now simplifying maintenance shop stocking problems. Only four sizes of clamps are required for a diameter range from $\frac{1}{4}$ to $1\frac{1}{8}$ in. Since each engine requires many different sized clamp applications—sometimes as many as 80 clamps are used on one engine—and there are many different types and sizes of engines that are being serviced simultaneously. The correct size of Marman clamps is always available for these applications where size cannot be predetermined. The flexibility and strength of the Marman clamp allows reuse on different applications. It is easy to install and requires no tools for installation. Cold flow leakage on hose can be stopped merely by tightening the clamp. Marman's clamp is tightened by pulling across the entire width of the strap. Up to 1250 lbs. clamping pressure can be applied. Further information about Universal Band Clamps may be obtained by writing the Marman Division, Aeroquip Corp., 11214 Exposition Blvd., Los Angeles 64, Calif. In Canada, Marman products are distributed by Aeroquip (Canada) Ltd., 287 Bridge-land Ave., Toronto 19, Ont.

Greenland Power Units

Nanortalik in West Greenland is now finally having a public electricity supply. The electricity works with all necessary installations, distribution system, etc., will cost about 3 million kroner. For the production of electricity in Greenland a total of 81 B&W diesel engines has been supplied, aggregating about 23,000 bhp. The electrification of Greenland has extended over ten years, the first electricity works being put in operation at Godthaab in November 1949. Since then, 17 electricity works have been built in Greenland towns, and the annual production of electricity has reached 15 million kwh. Continued modernization and industrialization of Greenland society will require a further extension of the electricity supply. The two B&W diesel plants for the Nanortalik electricity works each develop 180 bhp, which can be increased by means of turbocharging to 255 bhp. Apart from these, B&W engines have been supplied to the new Loran stations in East Greenland to aid shipping and air traffic in determining positions. For the two large radar stations built by Danish engineers for American account, altogether 14 B&W engines have been supplied.

Standby Facilities Increased

Officials of Principia College at Elsah, Ill. have added a new 150 kw generator set to existing standby power facilities to keep pace with the increased amount of power now required by the 500-student institution. The new unit supplements two standby units in service to meet the emergency requirements of the entire campus. In the event of an emergency main-line shutdown the new unit is set to take over the entire lighting system of the college and provide power for the operation of all heating equipment and elevators. Numerous electronic devices in use in the main library and in two classroom buildings are also serviced by the new set. According to college officials, an important feature of the installation is its ability to deliver full power in a matter of seconds without engine adjustments and warm-up. With a 6-110 engine manufactured by Detroit Diesel Division driving the generator, the 150 kw unit proved to be considerably smaller in size than either of the 100 kw sets already in use.

Kampo Buys 32 Tractors

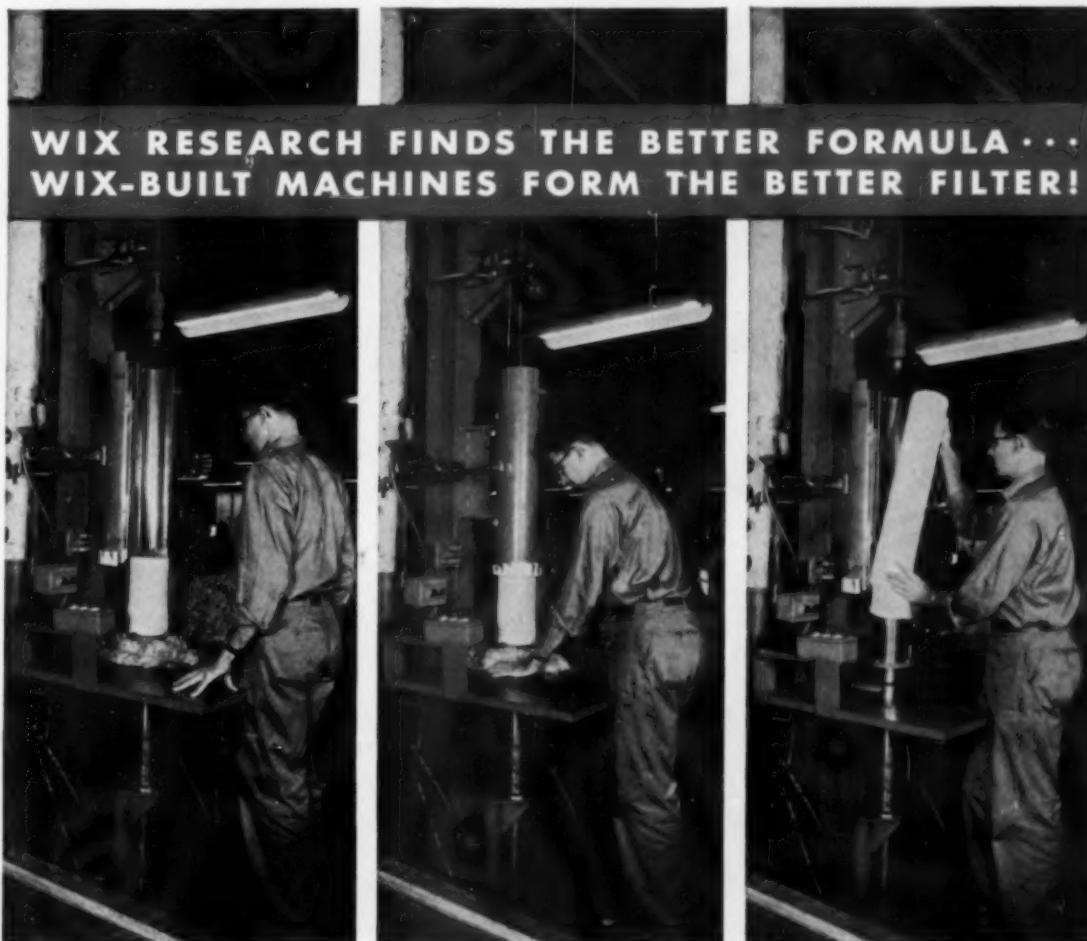
Kampo Transit, Inc., Neenah, Wis. has taken delivery of 32 International model DCOT-405 highway tractors as part of a fleet expansion and modernization program, it was announced by Fred Kampo, president. Cost of the truck purchase was more than \$500,000. The new In-

ternationals have been placed in service pulling chemical cargos in 40 ft. stainless steel tank trailers throughout a 6-state territory. The DCOT-405 tractors which have combination weight ratings of 73,000 lbs. are equipped with 195 horsepower diesel engines, 72-inch sleeper cabs, trailing axles, two-speed rear axles and five-speed transmissions. The Kampo fleet numbers 68 trucks.

GM Distributor

Johnson & Towers Baltimore, Inc. has been appointed industrial and marine distributor in Maryland for the Detroit Diesel Engine Division of General Motors. The company will handle industrial, construction, truck, marine and other power applications in its territory exclusively.

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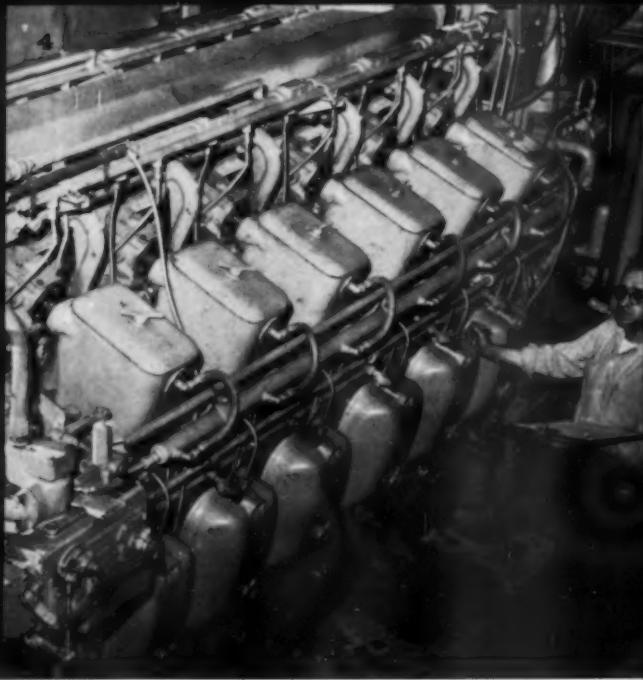
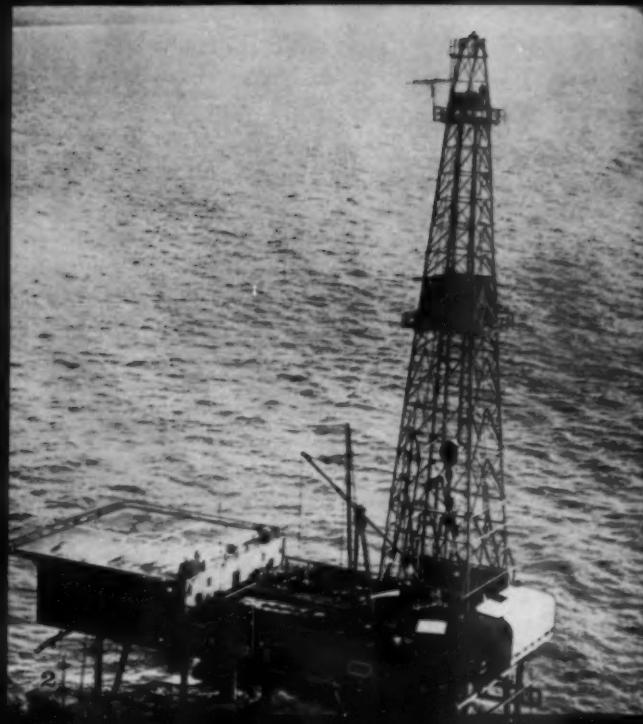
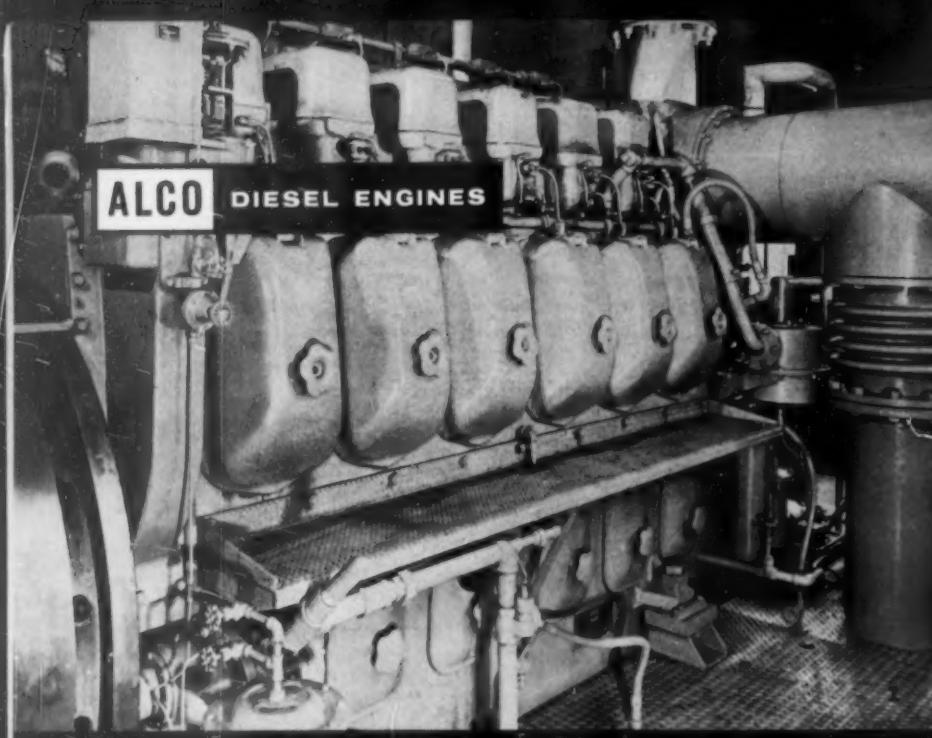
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THREE NEW DIESELS BY JOHN DEERE

**Compact and Practical
Engine Models Feature
Unique New Cylinder and
Block Design, Production
Technique**

By BRUCE W. WADMAN

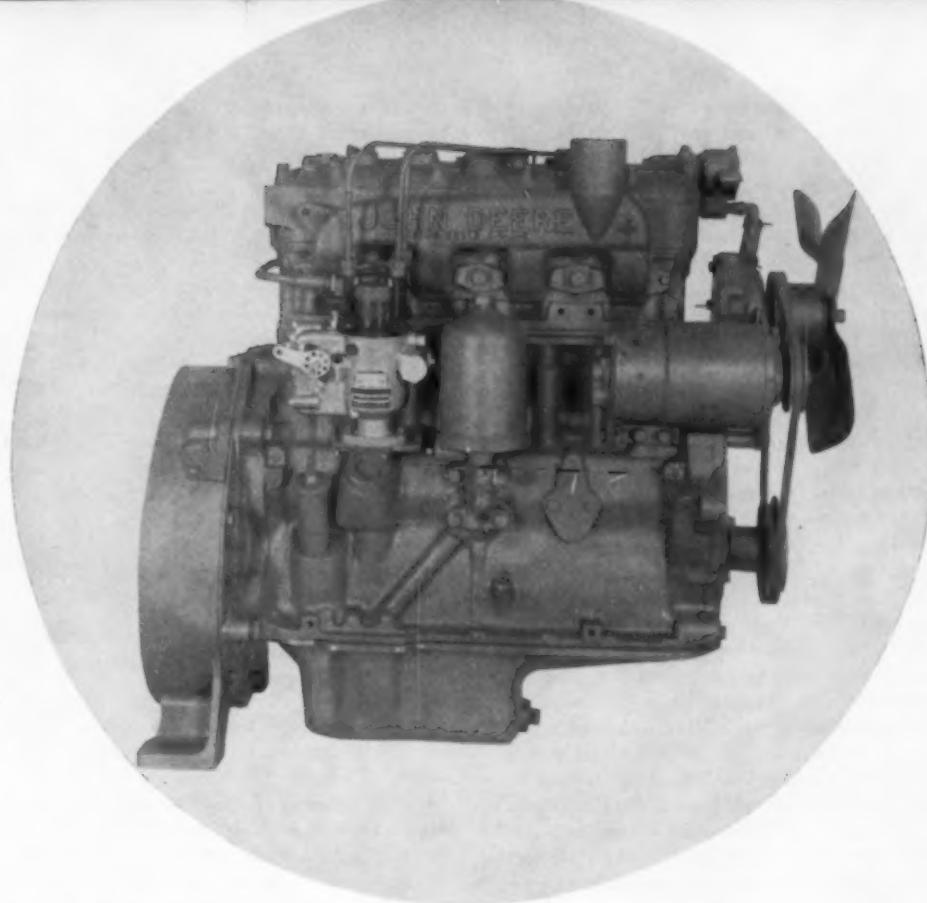
DUBUQUE, Iowa—Dec. 8, 1960—Today, I visited the John Deere Dubuque Works to see the three new small diesels that have recently been announced by this company. These new engines are very interesting in design, and amongst other important features, they are the first production engines we have seen that utilize a new integrated cylinder-liner deck assembly, which combines all cylinder liners in an engine into one insert unit. This idea was originally developed by Perfect Circle Corporation, and has been specially adapted to these new engines by John Deere research and development engineers.

The cylinder construction is an important cornerstone on which many elements of the engines are built. Major features, all of which will be discussed in detail later, include: 1.—Simplified and lightweight cylinder block with no sections in the cylinder area. 2.—compact design while retaining attractive features as wet cylinder liner construction, for example. 3.—precombustion chamber combustion system. 4.—oversquare bore and stroke.

As we move through the description of the engines, two main concepts will continually be evident—design simplicity and compactness. First of all, let's take a look at the vital statistics of the three engine models. The engines are all four cycle, valve in head, liquid cooled, with in-line cylinders.

Smallest engine is a four cylinder, $3\frac{1}{8}$ in. bore and $3\frac{1}{2}$ in. stroke, 145 cu. in. displacement diesel, rated 40 hp at 2500 rpm. Compression ratio is 19:1, maximum torque is 85 lb. ft. at 1300 rpm.

Next size is a four cylinder, $3\frac{1}{8}$ in. bore and $3\frac{1}{2}$ in. stroke, 165 cu. in. displacement diesel, rated 50 hp at 2500 rpm. Compression ratio is 19:1 and maximum torque is 115 lb. ft. at 1400 rpm.

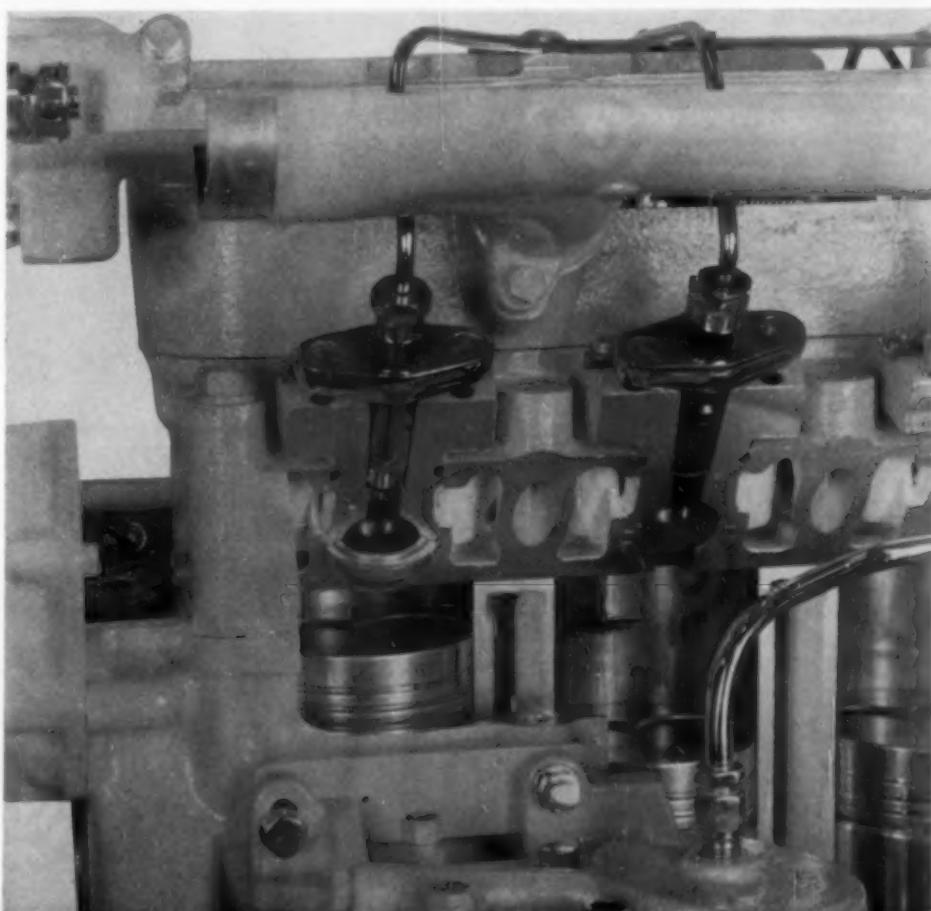


Largest engine is a six cylinder, $3\frac{1}{8}$ in. bore and $3\frac{1}{2}$ in. stroke, 248 cu. in. displacement diesel rated 80 hp at 2500 rpm. Compression ratio is 19:1 and maximum torque is 180 lb. ft. at 1300 rpm.

There are a number of design advantages in the new cylinder liner-deck assembly and engine block, but John Deere also had strong production reasons that made this construction attractive. Gaso-

View of a four cylinder diesel. Roots Master fuel injection pump is mounted vertically in same position as distributor on gasoline engines.

Cutaway closeup view of combustion system in new John Deere diesels. Note pre-combustion chamber and swirl cups in crown of piston.



line and LPG engines are also built in the Dubuque plant on the same production line as the diesels. John Deere wanted a basic engine design that could be adapted to any of the three types of engine with a minimum of production changes, while still retaining qualities that contribute to good design and long life for the different types of engine. This cylinder and block configuration has met the John Deere objectives of production ease and economy and good heavy duty engine construction.

Each individual cylinder liner is made by Perfect Circle of centrifugally cast alloy iron, which gives good strength properties to the liners. The liners are then brazed to a hot rolled steel deck, which is $(\frac{1}{16})$.3125 in. thick. The assembly, after being brazed together, is finished with boring and honing operations.

The brazing operation has proven very successful with excellent joint quality, and the joints are stronger than the liners themselves. The most important and difficult production problem that had to be solved was the maintaining of close tolerances required in the cylinder liner-deck assembly as it goes through production. This assembly must be right on target, particularly in lining up cylinder centers correctly as the assembly is installed in the block. John Deere has a sizable and closely controlled production setup to insure consistent quality of these units.

Cast iron cylinder block is simple, compact, and light in weight. In the cylinder area, the block is entirely open. Pilot holes are cast in to seat and seal the cylinder liner assembly as it is installed in the block, and a simple, rectangular type "O" ring seals the liner to the pilot bore.

Manufacturing flexibility is evident, in that several sizes of cylinder bores can be utilized in one basic block with only the necessity of machining the pilot holes differently to take specific size

Cylinder-liner deck assembly as it installs in the engine block.

Other side view of a four cylinder John Deere diesel showing fuel injector and pre-combustion chamber installations.

cylinders. For example, the four cylinder $3\frac{1}{8}$ in. bore engine and $3\frac{3}{8}$ in. bore engine use the same basic block.

The block is short in length, which is particularly advantageous in small engines. Larger cylinder bores between cylinder centers are possible with this design than in conventional engines because there are no block elements between the cylinder bores. The most important advantage from a performance standpoint is that wet cylinder liner construction can be utilized in this short block. Also, cooling water circulates freely and uniformly over the entire surface of the liners, further enhancing the good cooling qualities which are inherent with the wet liner design.

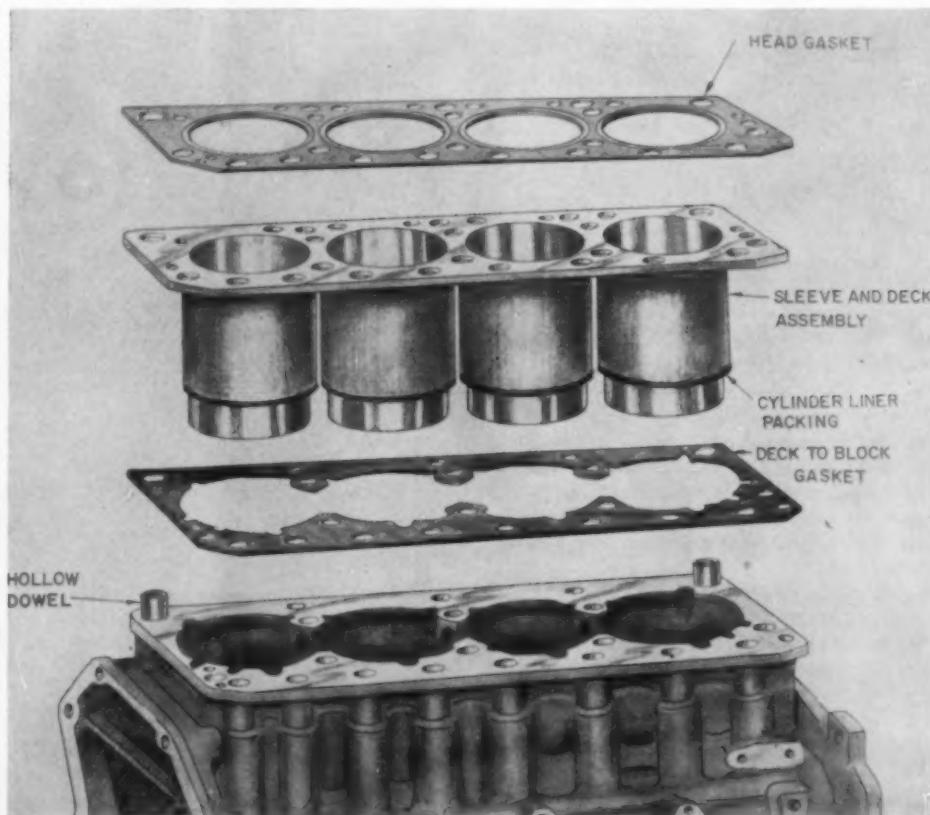
Other features of the block design are integral casting of tappet chambers, and location of crankshaft high in block for good support and rigidity. This is made possible because of the short stroke of the oversquare engines.

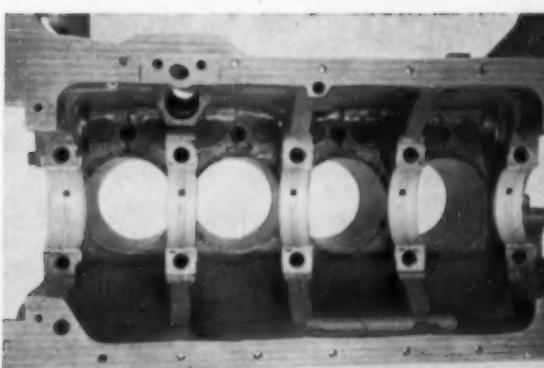
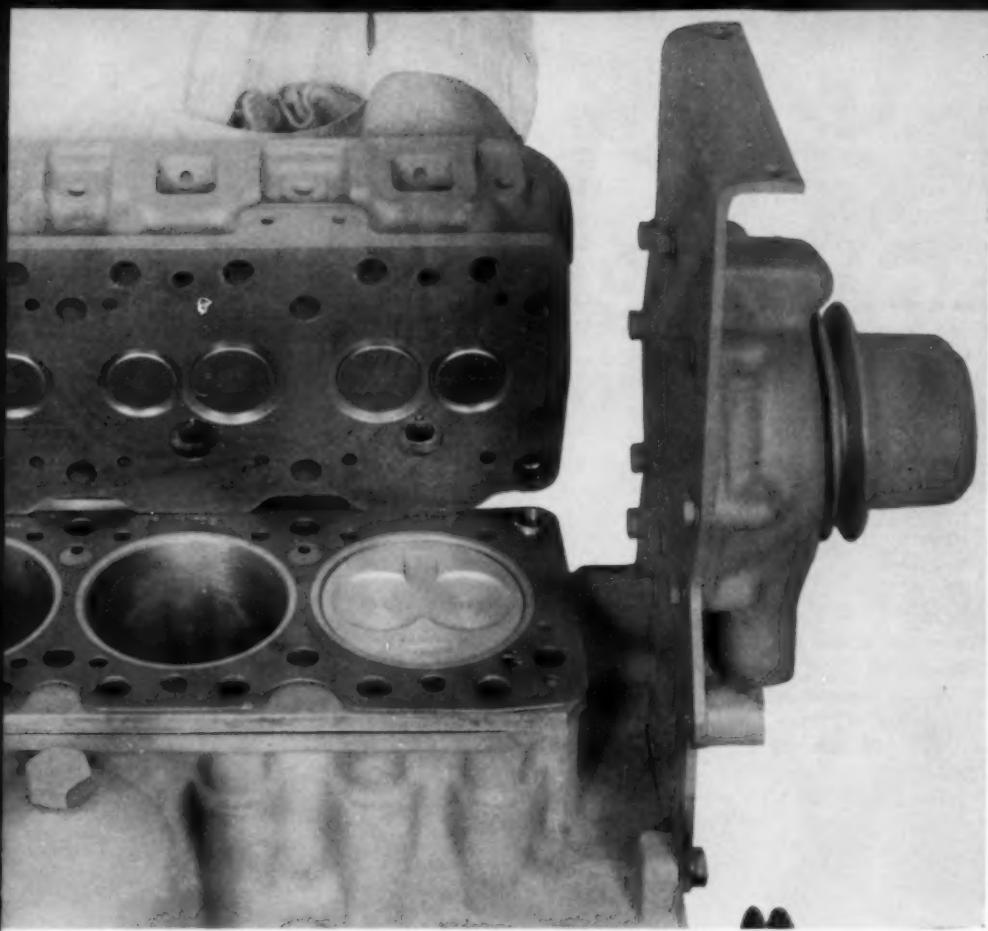
The accompanying illustrations give a good picture of the block construction and assembly of the liner insert unit into the block. I witnessed this process on several engines and was impressed by the speed and ease of installing these assemblies into the block. A machining saving is also found on the outside of the liners. Only the top and bottom are machined for fit into the deck and engine block pilot holes. The rest of the outside section is left unmachined. These liner assemblies can be bored out at least once in the field when engines are overhauled before the entire assembly is required to be replaced.

A single cast iron cylinder head is provided on



the four cylinder engines. The pre-combustion chamber is set in the head at an angle, and is easy to get at for servicing. There is a single intake and exhaust valve per cylinder. The valve





Underside of four cylinder engine block shows simplicity of design and crankshaft carrying position high in block for good rigidity.

This view shows cylinder-liner deck unit assembled in the engine block and the underside of the cylinder head. Note piston crowns also.

($3\frac{1}{8}$ x $3\frac{1}{2}$, 4 Cyl., 145 cu. in Diesel)

RPM	HP	Torque (Ft. Lbs.)	Fuel Consumption Lbs./Hr.
1500	27.0	94.5	.460
1900	33.0	91.3	.460
2100	36.0	90.0	.470
2500	40.0	84.0	.490

($3\frac{1}{8}$ x $3\frac{1}{2}$, 4 Cyl., 165 cu. in Diesel)

RPM	HP	Torque (Ft. Lbs.)	Fuel Consumption Lbs./Hr.
1500	32.0	112.0	.475
1900	40.0	110.5	.465
2200	45.0	107.4	.465
2500	50.0	105.0	.470

Above figures are observed figures, recorded at the flywheel on an electric dynamometer with a complete engine including fan as used on tractor, generator, oil pump and water pump and any other accessory necessary for operation as a unit.

The dimensions given below show the compact size of the engines:

Engine	Length	Height	Width
4 cyl. $3\frac{1}{8}$ in. bore	$32\frac{1}{2}$ "	$29\frac{1}{2}$ "	17"
4 cyl. $3\frac{1}{8}$ in. bore	$32\frac{1}{2}$ "	$29\frac{1}{2}$ "	17"
6 cyl. $3\frac{1}{8}$ in. bore	42"	$29\frac{1}{2}$ "	17"

These engines are now being produced in quantity at the John Deere Dubuque tractor works. John Deere officials also reported that the diesel is taking a significantly larger share of their total engine production as time goes on, and with these new models, the diesel is expected to become even more popular in John Deere equipment. The engines are used in the 1010 series crawler and wheel type tractor and the 2010 series crawler and wheel type tractors, both for agricultural and industrial applications. The engines are also used in various self-propelled equipment such as combines, cotton pickers, etc.

gear design is notable with short push rods and a compact assembly to insure consistency of valve gear performance. The camshaft is carried in the block beneath the push rods and fuel pump.

The pre-combustion chamber is shown in accompanying illustrations. Stellite material is used in the lower half of the pre-cup and cast iron in the upper half. It is surrounded with a generous size cooling water jacket. The pre-combustion chamber discharges into swirl cups in the cylinder formed by the specially designed crown of the piston. Glow plugs are installed in each pre-chamber for good starting performance.

A Roosa Master distributor type fuel pump is installed on all the engines. American Bosch single orifice, outward opening nozzle injectors inject the fuel into the pre-combustion chambers. Low injection pressures of only 1500 psi, single large orifice in nozzle and simplicity of distributor pump should make this fuel system a consistent and troublefree performer. A special John Deere fuel filtering arrangement consists of a sediment bowl and primary and secondary stage micronic fuel filters with Purolator filter elements.

An interesting feature is the drive for the Roosa-Master fuel pump. It is gear driven off the cam-shaft and is mounted vertically in the same place as the distributor on the gasoline engine versions. The same drive shaft extends down into the oil pan and drives the lubricating oil pump. This pump installation and drive again points out the design flexibility of the new engines and the adaptability of the Roosa pump.

Pistons are cast from aluminum alloy for high

strength and have four piston rings—a chrome plated top ring, two additional compression rings and an oil ring. The swirl cups in the piston crown can be seen in accompanying illustrations. The crankshaft is drop-forged, induction hardened steel, statically and dynamically balanced. The five main bearings are 3 in. dia. and of steel backed copper lead type.

A full pressure lubrication system is featured, supplying oil through drilled passages to all moving parts. A full flow lube oil filter, of John Deere design, with Purolator filter element will be used. The cooling system has a permanently lubricated water pump belt driven at front of the engine and thermostatic control with fixed bypass. Air cleaners used on the engines are Donaldson oil bath type and a crankcase ventilator discharges fumes at the bottom of the engines. Starting is electric with a 12 volt Delco-Remy motor.

The engines use Number 2 diesel fuel under most operating conditions.

The four cylinder engines are also smooth running in operation with low vertical vibration levels due to the oversquare bore and stroke and short distance between centers of cylinders.

These new engines have good life built into them. For example, the sleeve and deck plate has been designed to last approx. 4000 hrs. under normal usage before reborning or replacement becomes necessary. They are rated at 105 bmeep with full accessories, and the following table shows performance characteristics of the two four cylinder diesels at four representative points in their operation range:

HOUMA TAKES A GIANT STEP

By DOUGLAS SHEARING

Editorial Director, Diesel & Gas Engine Progress, McGraw-Hill Publications Co., Inc.

AN expansion of record proportions at Houma, Louisiana, has made the municipal power plant completely self-sufficient, met a growing consumer demand, and trimmed fuel costs to a slim 2.72 mills per kilowatt-hour. This giant step was realized with the installation of three 5,250 horsepower Nordberg duafuel diesels, raising plant capacity to 25,350 hp.

Progressive Houma has never favored a mincing gait and this latest expansion is the third progressive stride in the past dozen years. First, in 1949, the city made an addition to the old plant that housed five oil-burning engines totaling just 2,900 hp and installed three 2,000 hp Nordberg natural gas burning engines. In January, 1954, Houma stepped up in size and put into service a 3,600 hp Nordberg duafuel diesel. Then came the giant step. Three old 300 hp oil engines were removed in the Winter of 1958, a big plant addition was constructed, and in February, 1959, the city put on the line the three big 10-cylinder duafuel engines, each rated 5,250 hp, 3,750 kw at 257 rpm.

With the new prime movers building their production totals from week to week, Houma discontinued purchases from the private power company on April 15, 1959, and terminated its contract on August 10th. The plant was on its own, entrusting a major portion of its growing load to the new engines. In 17 months, from February 1959 through July 1960, the three big units produced a combined total of 53,484,000 kwh, 68.2 per cent of the plant's 78,430,000 kwh. The 3,600-hp engine contributed 8,298,000 kwh and the three 2,000-hp units a combined 16,648,000.

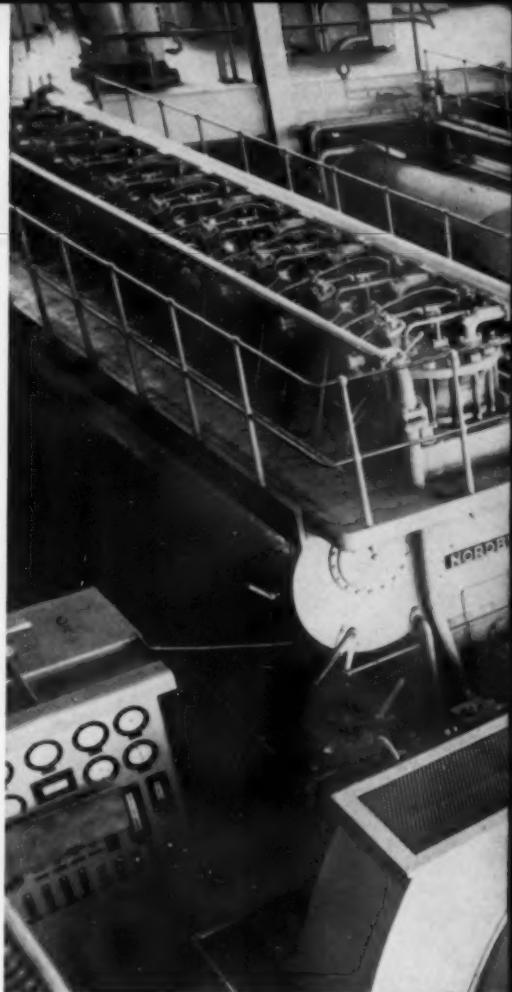
The big engines dominate the picture on the basis of sheer size and power but all seven Nordberg engines render service in important volume and with notable production economy. In turning out their 53,484,000 kwh, the big units (Nos. 10, 11 & 12) consumed 549,578,900 cu. ft. of gas and 300,869 gal. of pilot fuel, an average of 10.27 cu. ft. of gas and .00562 gal. of oil per kwh. The gas has a lower heating value of 930 Btu and the oil 137,500 Btu per gal., so the average heat rate for these engines was a respectable 10,324 Btu per kwh. The gas was billed to the plant at 20.5 cents per mcf and the delivered price for oil averaged 10.4 cents, giving the new engines an average fuel cost of just 2.689 mills per kwh.

The 3,600-hp engine (No. 9) used 80,278,800 cu. ft. of gas and 72,280 gal. of fuel oil in generating its 8,298,000 kwh. This meant less gas per kwh. and a little more oil—9.67 cu. ft. and .00870 gal.—

which resulted in the excellent efficiency of 10,189 Btu per kwh and a slightly higher cost, 2.887 mills. The three 2,000-hp units (Nos. 6, 7 & 8) reverse the picture. In producing their 16,648,000 kwh, they consumed more gas and less oil for a somewhat higher heat rate but excellent economy. Total consumption was 183,645 mcf of gas and 183,645 gal. of oil, an average of 11.03 cu. ft. and only .00407 gal. of oil per kwh. This produced a heat rate of 10,817 Btu and a fuel cost of 2.684 mills per kwh.

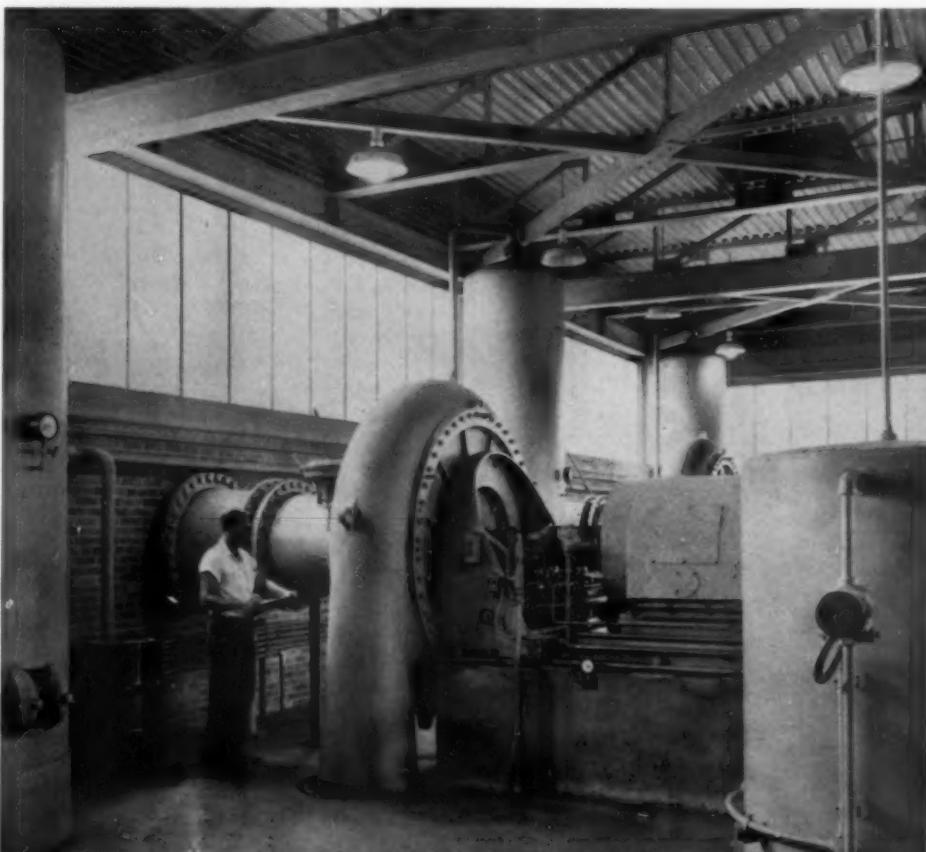
Actually, the new No. 12 engine was both the efficiency and economy leader of the plant, averaging 10.09 cu. ft. of gas and .00514 gal. of oil per kwh for the full 17-month period to attain a heat rate of 10,090 Btu and a fuel cost of 2.603 mills. It should be noted that all the big engines are at a disadvantage in these calculations, since the period considered takes in the first months of break-in and adjustment, including some initial operation on oil alone.

It has been a problem for Houma to keep up with a load that keeps rising swiftly and sharply. The city has grown, with 25,000 population within the city limits and 40,000 in greater Houma, but this is not the biggest factor in load growth. Actually, the area served by the municipal plant cannot expand since it is surrounded by private power companies and REA cooperatives and the plant supplies about 75 per cent of the present city area. In 1949, there were 5,000 customers and in 1960 the figure was up modestly to 6,700, most of them residential consumers. But the increase in consumption has been anything but modest. In 1949,

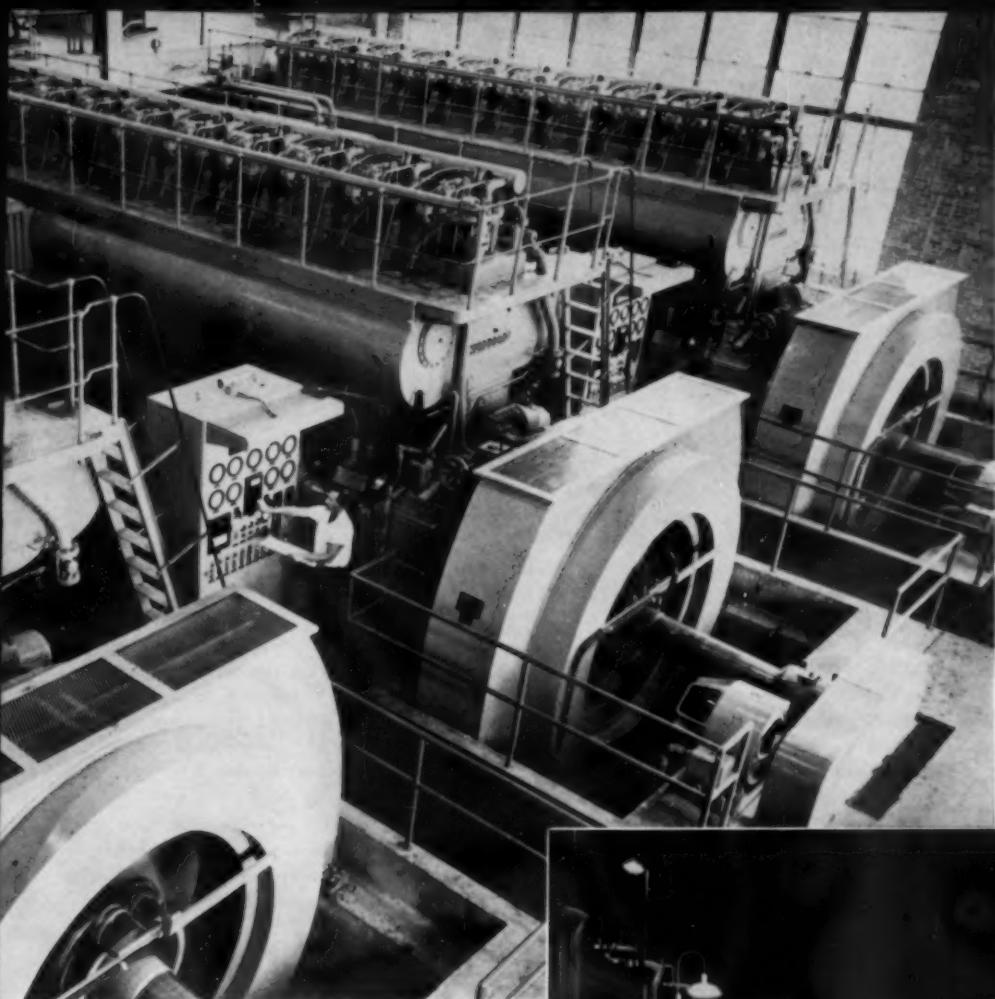


the average customer used 1,950 kwh; in 1960, the average will run about 4,500 kwh.

Much of the increase in demand has been good solid load development, but a lot can be attributed to air conditioning which makes for spectacular hot weather peaks. Back in 1949, peak load for the



Each of the 5250 hp engines is served by, from left, a starting air tank, Elliott centrifugal blower, fuel oil day tank and surge tank installed on the mezzanine floor.



Houma installation of three Nordberg 10-cylinder dual-fuel engines, each rated 5250 hp at 237 rpm. Behind the 3750 kw Elliott generators are the panels housing all gauges, Alnor pyrometer and 12 point alarm system.

Portions of the three newest Nordberg engines are visible in this impressive night-time view of the Houma, La. municipal plant addition. To the left is the three-section induced-draft cooling tower which serves the three new Nordberg dual-fuel engines. A 1200 gpm pump for each engine circulates water at 90 degrees to the lube oil cooler and jacket water heat exchanger and a 300 gpm pump provides water at 85 degrees to the intercooler.

year was 4,500 kw; in the Summer of 1960, it hit a towering 15,800 kw. A survey two years ago showed that 22 per cent of the customers had air conditioners, but city officials now estimate it is between 35 and 40 per cent.

In this southern Louisiana city, the Summer load picture prevails from mid-May to mid-December. Through the hot days and evenings, the load runs up around 15,000 kw. At night the level drops to about 6,000 kw. To carry the maximum loads, the plant runs all three of the big 5,250 hp engines plus the 3,600 hp unit, and one or two of the 2,000 hp engines. To handle the 15,800 kw peak, it was necessary to run all seven Nordbergs at near 90 per cent load. For the valley load, two of the big units run through the night. In the four-month Winter season (Houma only classifies two seasons), maximum load runs to 6,500 kw and



minimum down to 2,200 kw. Two of the big fellows carry the maximum and two of the 2,000 hp units handle the minimums.

Under the leadership of Mayor Leon Gary, Houma took full advantage of its location, literally on top of a gas field, without turning the community over to the drillers. Property owners authorized the city to negotiate a community lease with an oil company calling for the drilling of directional wells from the outskirts of town to tap the natural gas under Houma's homes and streets. In return all concerned (including the city itself) receive royalties and a guaranteed low-cost gas supply. The city operates the local gas utility, selling gas to its power plant at a current price of 20.5 cents per mcf. If the price is high, the city makes more money on its gas business. If the price is low, the city makes more money on its power plant. The city can't lose in this situation.

All the dual-fuel engines use a good quality No. 2 diesel fuel as pilot oil and Houma takes advantage of the Intercoastal Waterway to keep the cost of transportation from New Orleans down to 1 cent a gal. The plant has four storage tanks totaling

55,000 gal., and buys fuel oil by the barge-load, 30,000 gal. at a time. A detergent-type lubricating oil is purchased in 4,000-gal. lots, held in a storage tank, and pumped to the engines as required.

Engine air is admitted through self-cleaning filters outside the building, then through intake silencers to the motor-driven blowers which discharge through the intercoolers to the engines. Exhaust temperatures determine the volume of air admitted, acting through pneumatic controllers.

Houma makes a handsome profit on power sales. In the past 10 years, the excess of income over expense after allowance for interest and depreciation has never failed to exceed a quarter-million dollars. The total profit for the 10 year period was an impressive \$3,129,817.20. In addition, the plant donates about a million kwh to the sewer plant and an equal amount for street lighting.

Houma's big power plant is operated under the direction of R. J. Yakupack, Superintendent of the Light and Water Plant, assisted by Power Plant Supervisor Norris Lirette.

Equipment Serving 5,250 HP Engines

Engines	Nordberg
Generators	Elliott
Governors	Woodward
Cooling tower	Marley
Jacket water pumps	DeLaval Imo
Thermostatic valves	Amot
Heat exchangers	Ross
Lubricating oil	Essoflect
Lube strainers	Elliott
Lube filters	CFC Fullo
Fuel oil	Esso
Fuel filters	Nugent
Fuel injection pumps	American Bosch
Air filters	American Air Filter
Blowers	Elliott
Silencers	Burgess-Manning
Air controllers	Bristol
Intercoolers	Young
Starting air compressors	Gardner-Denver
Exhaust pyrometer	Alnor
Switchboard	Westinghouse

ENGINE AND TRUCK BUILDER COOPERATE TO ACHIEVE OUTSTANDING FUEL ECONOMY

By BRUCE W. WADMAN

LAST fall, I had the opportunity to visit with some of our friends at the White Motor Co. concerning the new fuel economy they have achieved with large displacement diesel truck engines through coordinated research and testing in cooperation with Cummins Engine Company. This scientifically conducted program resulted in White chassis and Cummins engine developments that produced outstanding results in fuel economy and performance. These results will be detailed later in the article. The engines that have been utilized in this program are the new Cummins economy NHE-195 and NHE-180 truck diesels.

We will, in this article, discuss details of important engine and vehicle features that were either developed or proven in conjunction with the exhaustive and accurate vehicle testing undertaken by White. These developments and test results will be of interest to truck users, but as important, is the cooperative relationship between engine and

vehicle manufacturer illustrated in this joint product development and testing program.

This kind of close cooperation and willingness to investigate closely the best possible application of the engine to the equipment in order to obtain the best possible operating economies from the engine and the equipment, can be considered a milestone in the growth of good relationships between engine builder and equipment builder. The one who receives the ultimate benefit from this relationship, of course, is the engine and equipment user.

First of all, let's take a look at the engines and important new features that contributed to the excellent test results. The NHE-195 is rated 195 hp at 1950 rpm. The NHE-180 is rated 180 hp at 1950 rpm. These two engines have the same bore and stroke of $5\frac{1}{8}$ in. x 6 in. and displacement of 748 cu. in. as the well known NH-220 engine.

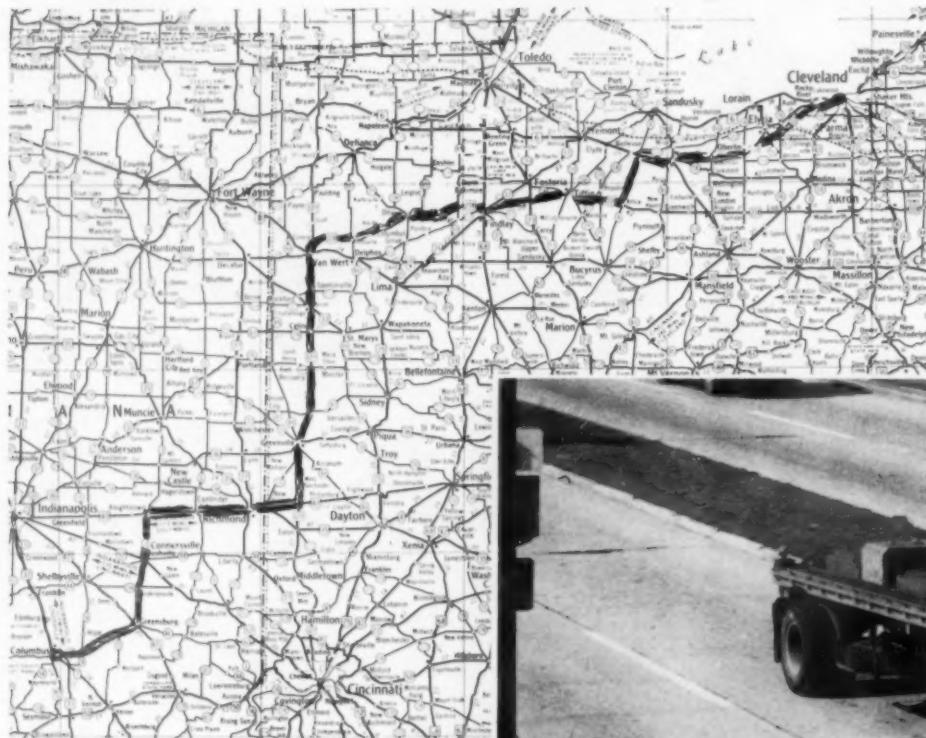
The two engines have been designed to a 1950 rpm governed speed rather than 2100 rpm, and a new fuel curve has been tailored to the requirements of these new engines. The engines are designed for over-the-road truck application where the operator desires maximum fuel economy rather than higher road speeds with higher horsepower engines.

This derating in speed and fuel has resulted in significant savings in fuel economy. Reducing rpm and power settings reduces friction and breathing losses and gives more excess air for better combustion. The following design improvements, mostly in the fuel system, have further improved economy and provided for more consistent performance over the life of the engine.

1.—The Cummins PT fuel pump has been modified to provide governor control of fuel delivery to the injectors. This pump has the unique feature of compensating for wear in such parts as the supply pump to maintain the constant rate of fuel delivery to the injectors throughout the life of the fuel pump. It also provides a tailored torque curve with torque peak at lower rpm than in previous engines.

2.—Reduced clearance injectors give less clearance between injector plunger tip and cup at bottom of stroke, reducing carboning.

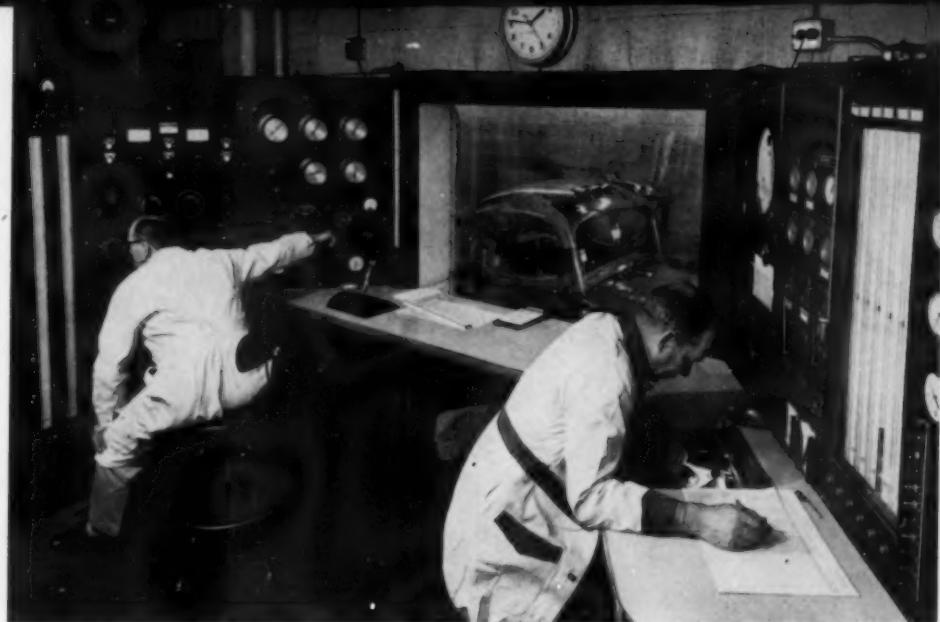
3.—New injector cups have eight .007 spray holes at 17° angle, improving mixing of fuel and air—previous cups had seven .007 diameter holes at 21° angle. The cups are also now made of a



Map of the test run route.

White 9000TD equipped with NHE Cummins diesel, starting a test run from Cleveland. Unit made test run with a double trailer combination consisting of tandem-axle flat-bed trailer and four-wheel, flat-bed trailer in "double bottom" combination. Weight was controlled by using concrete blocks.





Chassis dynamometer in Engineering Department of The White Motor Company on which coordinated program of development work was carried out. Here, virtually every type of road condition can be reproduced. Shown is test work being done on road test unit #1 which was one of the vehicles used in this cooperative test program.

stainless steel alloy to reduce erosion in spray holes.

4.—Steel rocker lever bushing on injector rocker arm reduces variations in injector adjustment previously caused by wear of softer bronze bushings used in earlier engines.

5.—Inlet valve timing was advanced 10° to provide better breathing for improved economy. Timing tolerance has also been tightened in production engines to reduce fuel economy variations. The accompanying fuel curve comparison between the NH-220 and the two new NHE engines illustrates the significant fuel consumption improvements in these new engines.

Now, we will move into the White trucks to examine features of the engine application in these vehicles that are also contributing to optimum operating economy. The White truck models included in this development were the 4400TD and 9000TD diesel truck tractors. These engines are now also available in 3400TD and

5400TD truck models to cover the full range of over-the-road trucking applications.

First of all, a new cooling fan was developed and utilized after careful testing. This fan adequately cools the truck while absorbing only 2 per cent of engine power. This compares with as much as 10 to 12 per cent for many truck fan applications. Special exhaust systems were studied during the road tests, and it was determined that they could affect fuel economy as much as 2½ per cent. Outside air intake was utilized replacing a former system that used a thermostatically controlled valve to allow air to be drawn from outside in warm weather and from inside in cold weather. This new installation improved air flow to intake of engine to provide for better fuel economy.

The above developments in the engine and in the truck installation of the engine may in each case seem relatively small, but when all are added together, they become very significant as will be seen in the test results from actual road testing.

These tests were conducted under the supervision and direction of Earl H. Behrend, Experimental Engineer and Charles L. Moon, Asst. Experimental Engineer at White. Mr. Moon has provided us with the description of test procedures.

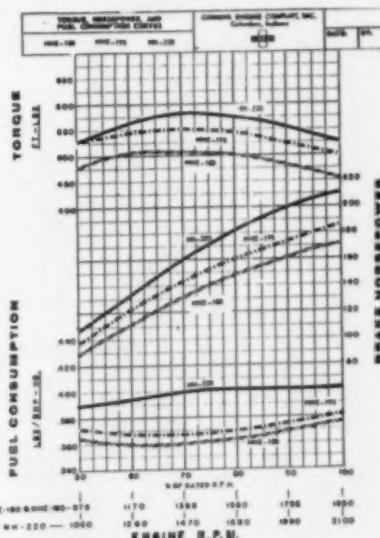
The test runs were made between The White Motor Company, Cleveland, Ohio and The Cummins Engine Company in Columbus, Ind., over a course outlined on the accompanying map. The course was measured with calibrated Sangamo Tachograph and is 355.0 miles long. From the map it may be observed that the test course was in no way a special course but that an average truck route possessing average traffic conditions was used. This included over-the-highway running as well as stop-start driving in city traffic. Upon entering or leaving Cleveland alone, more than 20 miles of city driving was encountered. The trip was made one direction one day and the return trip the next, etc.

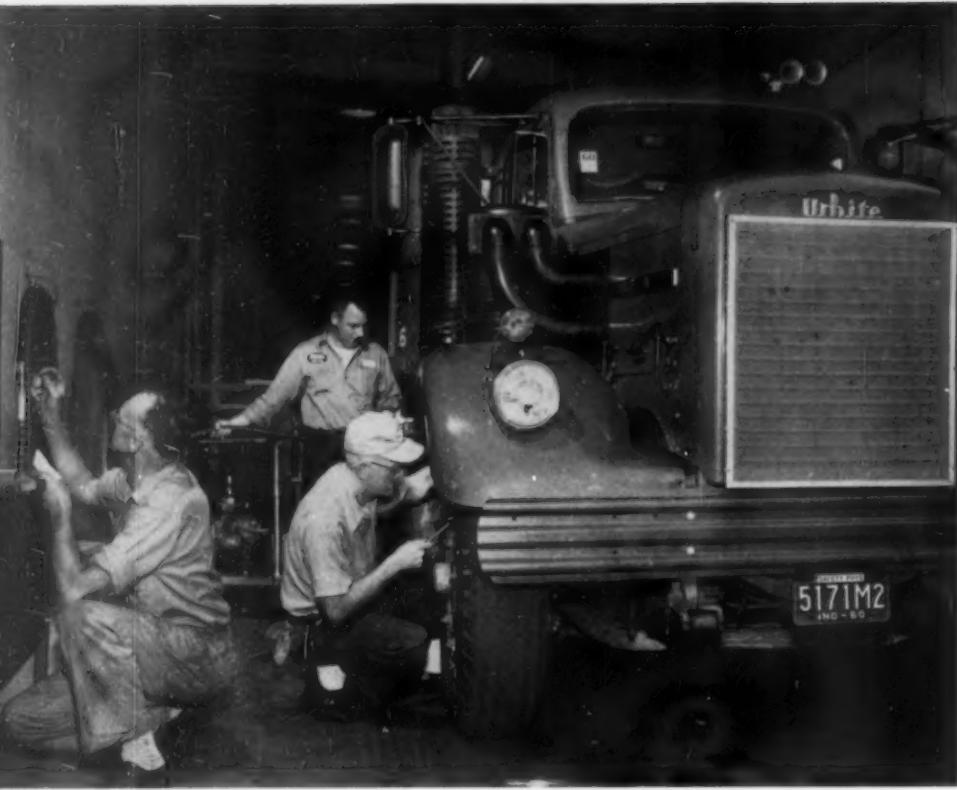
All White test units used standard lubricating oils and greases consistent with each manufacturers' recommendation and the test units were continually subjected to rigid maintenance checks

and repeated performance tests on White's chassis dynamometer to insure that they were always up to the manufacturer's specification. Each test unit was equipped with a Sangamo rpm and a Sangamo mile per hour tachograph, and the fuel tanks were reworked to permit complete fuel drainage. Two identical round nose tandem axle van type trailers were employed for gross vehicle loads up to 59,000 lbs.; also a pair of flat bed tandem axle trailers coupled with single axle flatbed trailers in a "double bottom" arrangement were used for loads of 65,000 lb. and 71,500 lb. gcw.

All fuel consumption was measured on a weight basis, that is pounds of fuel consumed, to reduce the amount of error that could possibly occur from the human element in topping off a fuel tank. A barrel and weight scale of adequate size to fuel any tractor used in the test with one weighing operation was used to further reduce the possibility of error. The total consumption of fuel on a weight basis was then converted into gallons of fuel at fuel temperature of 100° F. At each refueling of each tractor an A.P.I. hydrometer was used to record the fuel degrees A.P.I. and temperature degrees Fahrenheit for the above conversion. To insure that the method of weighing fuel was accurate to within 1 per cent, fifteen specific steps

This power curve shows a comparison of torque, horsepower and fuel consumption of the NH-220, NHE-195 and NHE-180. The fuel curves demonstrate the large reduction in fuel used per horsepower when the maximum horsepower and speed of the large displacement engine are reduced. The curves show observed horsepower in Cummins' Research Laboratory, and the normal altitude and correction factors have not been applied so these are not the regular published ratings. However, this power curve serves to indicate the excellent fuel consumption characteristics of the NHE series engines.





One of the White test tractors undergoing refueling operation. Complete inspection of vehicle is carried out while it is being refueled. Here determination of A.P.I. number is being conducted by technician in foreground. Fuel stations were located at each end of the 355 mile route between Cleveland, Ohio and Columbus, Indiana. Fuel was charged out by weight, then interpolated in gallons.

were rigidly adhered to when draining the remaining fuel from a vehicle at the end of a test run and refueling the vehicle preparatory to the next run. Results reveal that the degree of accuracy was closer than the 1 per cent White was targeting for in the tests.

Ten drivers were used in these tests and although all are well qualified experimental mechanics and drivers with thousands of miles of actual fleet driving experience, a specific method of driving was developed to assure consistency of results. The runs were termed "50 mph controlled runs" which means that a maximum speed of 50 mph was observed and held wherever possible with the exception, of course, of obeying all posted speed regulations. In a start from any stop, the drivers were instructed not to split shift or skip any gear but to use all gears in sequence and to accelerate the vehicle in each gear to governed speed and arrive at the terminal speed as quickly as possible before going into direct gear. Instructions were also given to avoid luging the engine and avoid long coasting periods in neutral when approaching traffic lights, etc. and that the engine was to be used as a brake through the down shifting and selection of the proper gears (gear skipping was permitted) by the driver within the realm of his good judgment with consideration to safety and maintaining control of the vehicle. The

consistency of the results, driver-to-driver, on the same vehicle using this method was surprisingly well within 1 per cent.

In addition to the controls placed on the driver, the course, the units, and the fuel measuring methods, the various trailers employed in these tests were switched from truck to truck and the drivers were switched from truck to truck daily. At all times at least two units were involved in running, the same course, the same direction on the same day subjecting them to the same atmospheric and road conditions, and further controls were exercised by switching the drivers as many as two to three times during the course of a given run.

In addition to many thousands of miles of actual road testing, a coordinated program of chassis dynamometer development work was carried out in the interest of improving the fuel economy of these units. Of particular importance was the work performed in reducing the parasitic horsepower loss encountered in driving the cooling fan. Many fans of various designs were employed until the optimum fan as far as diameter, number of blades, blade width, and blade pitch could be selected to produce adequate cooling for a given vehicle with a minimum horsepower requirement. The results of this program have been shown earlier in the article. As pointed out above, the chassis dynamometer was also used to keep a constant check on the performance level of all test units to assure that they were always up to the manufacturer's specification. The chassis dynamometer was also employed to quantitatively evaluate new designs and improvements, as related to the overall vehicle.

The following charts give actual results of specific runs and actual fuel economies achieved. Over

50,000 miles were accumulated on the White-Cummins test tractors to achieve these results.

Specifications of a Typical Tractor-Trailer Combination in the Test Runs:

Tractor	White 9000TD
Axle Ratio—(Based on 59,000 gcw)	4.3
Transmission	10 speed, 10th dir.
Tires	10.00 x 20
Engine governed at	1950 rpm
Test No. 1—59,000 lbs. gcw single trailer:	

	AVG. MPH	MPG
1. 9000TD, NHE-180 engine	38.70	7.05
2. 9000TD, NHE-195 engine	39.50	6.89

Test No. 2—65,000 lbs. gcw single trailer:		
	AVG. MPH	MPG
1. White 9000TD, NHE-195	39.30	6.30

Test No. 3—71,500 lbs. gcw double trailer:		
	AVG. MPH	MPG
1. White 9000TD, NHE-195	38.50	6.02

Several gear ratios were tested under each condition of the road tests to determine optimum gearing for the various conditions. This information is now being utilized to make optimum gearing recommendations for each customer's specific needs.

For the type of run and loads carried in these tests, the fuel consumption figures are very good. These results, for example, when compared to NH-220 and previous NH-180 and NH-195 engines used under similar conditions, show an increase in miles per gallon from between 9.0 per cent to 18.0 per cent with the new NHE engines in their trucks, according to White engineers. This, then, is the highly successful culmination of the development and test program. The results mean real savings to the truck operator in two important ways: 1. lower operating costs due to improved fuel economy and, 2. better performance from his engine and truck in terms of operating consistency and long life.

I want to thank Mr. Moon, and also D. B. Wheeler, Asst. to the Chief Engineer, and G. C. Frank, Technical Assistant to the President of White Motor Co. for their cooperation in the preparation of much of this information.

The diesel engine industry is offering engines today with greatly improved operating economies and flexibility, and engine builders have extensive programs of continued product development and improvement underway. The equipment manufacturer, like White Motor Company in this case, who takes fullest advantage of the engine's potential in applying it to his existing equipment or designing it into his new equipment, is taking a long and strong step in insuring his equipment's acceptance and success with the ultimate consumer out in the field.

White is continuing to examine further possibilities for increased operating economy in cooperative work with Cummins. With this full utilization of the specific talents and knowledge of both the engine builder and the equipment manufacturer, the engine will be applied and installed to maximum advantage in delivering to its fullest capability for optimum vehicle performance.

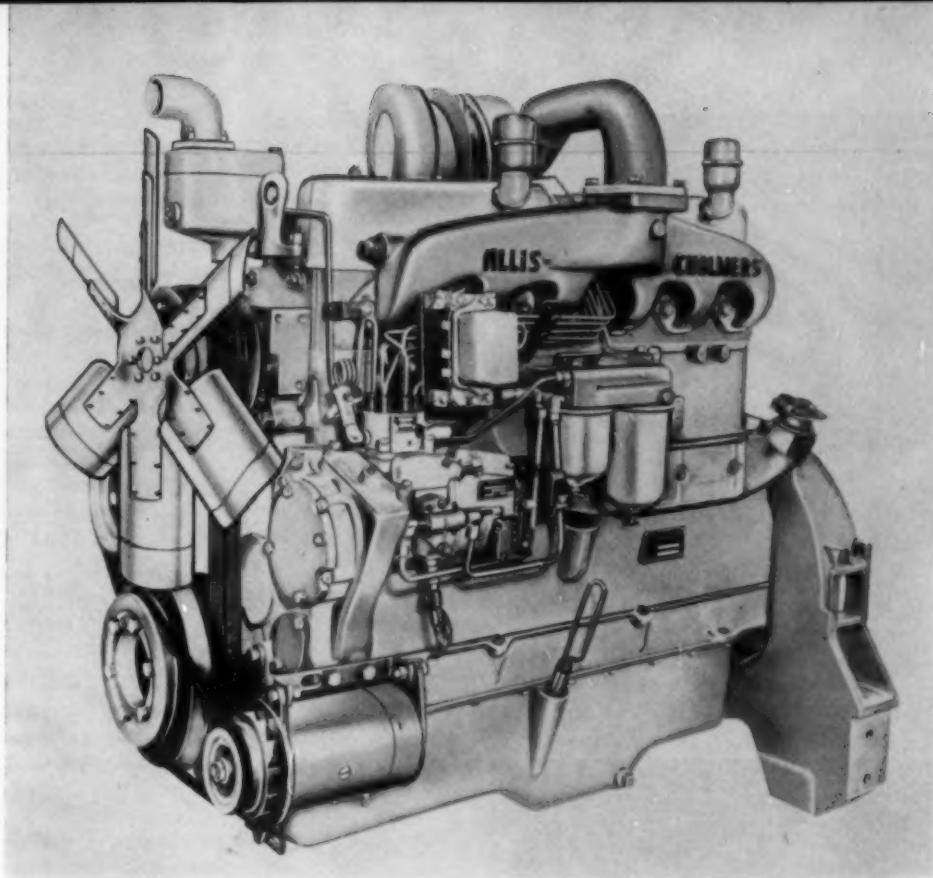
Industrial version of the 11000 which is rated 210 hp at 2200 rpm. Engine is fitted with Schwitzer turbocharger and uses American Bosch fuel injection pump.

HARVEY, Illinois. December 12—Here at the main engine works of Allis-Chalmers today, two new engines were officially added to the company's growing family of high output, open combustion diesels. Continuing in the "thousand series," the engines are designated 10000 and 11000 and have a full throttle rating of 145 and 210 horsepower respectively at 2200 rpm. Thus they fit into an important slot right below the 16000 and 21000 diesels, rated 235 to 350 horsepower, that were successfully introduced about a year and a half ago. The family identity of the new diesels is apparent in overall appearance, as well as in their design, construction and operating characteristics. Both of the new engines are direct injection, four-cycle, six-cylinder, $4\frac{1}{4}$ in. bore by $5\frac{1}{8}$ in. stroke diesels, the 10000 being the naturally aspirated model and the 11000, the turbocharged version. Fuel economy continues to be a dominant feature with the turbocharged 11000 at .366 lbs./bhp/hr.

Outlines Applications

The new diesels give Allis-Chalmers coverage in a very important horsepower application range. Talking to Louis Schultz, engine product sales manager of the Company's Engine Division, he stated, "With these two new models, we're in an excellent position to work closely with many manufacturers of off-highway equipment, especially rubber tired vehicles up to 20 ton payload, compressors of 305 to 600 cfm capacity, excavators in the $\frac{3}{4}$ to $1\frac{1}{4}$ yd. class, etc. Both open and closed type power units are available, as are complete skid-mounted generator sets in the range up to 66 kw with the 10000 and up to 110 kw with the 11000. As marine propulsion engines, the 10000 and 11000 are well suited for both commercial work boat and pleasure craft installation."

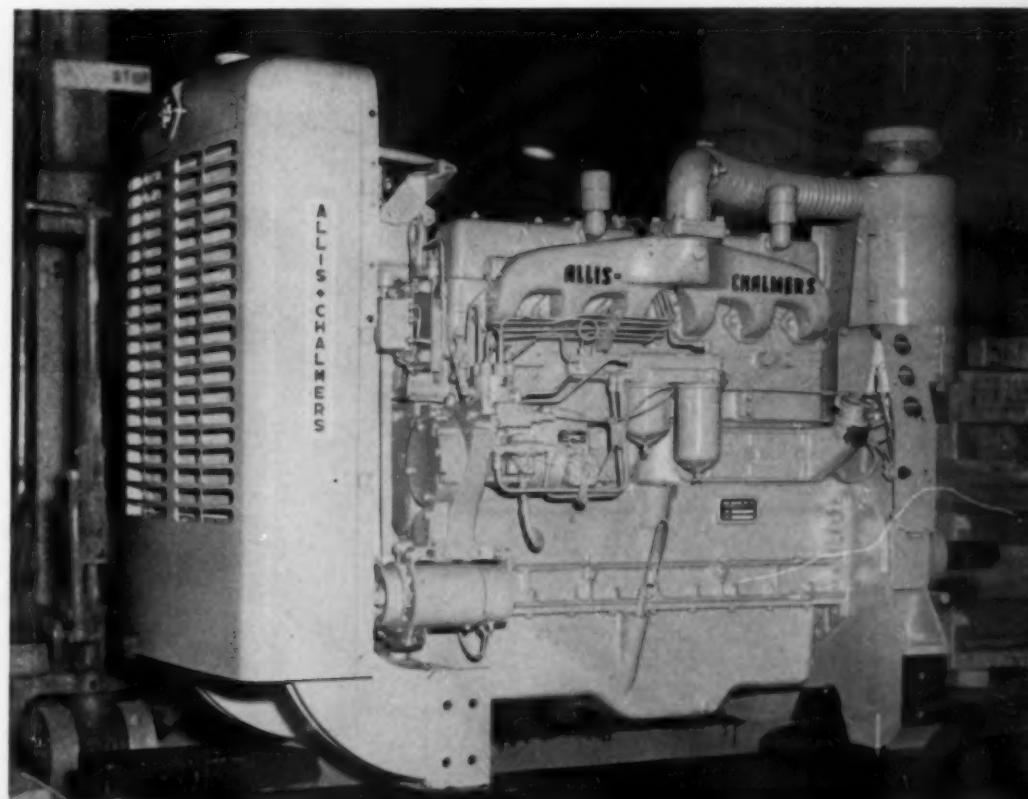
Development on the two new engines has been under way here at the Harvey facilities for some time, with particular emphasis following introduction of the 16000 and 21000 models in 1959. Outside of the rugged proving grounds tests in motor scrapers and crawler tractors, the 10000 and 11000 have completed full dynamometer testing here in Harvey including the 24 hr./day endurance runs on a special dynamometer which, in an established pattern, starts and stops the engine, and subjects it to changing loads and speeds. Commenting on these tests, Director of Engineering A. F. Ochtman pointed out that the engines have the same high continuous torque characteristics of the $5\frac{1}{4}$ in. bore engines (16000 and



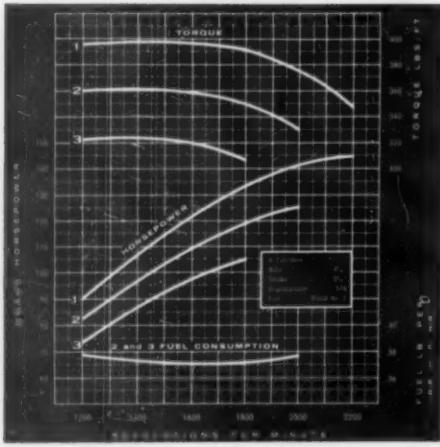
145-210 HP DIESELS ADDED TO ALLIS-CHALMERS LINE

Naturally Aspirated and Turbocharged 516 Cu. In. Diesels Feature Open Combustion System; Applications Range from Off-Highway Equipment to Marine Propulsion

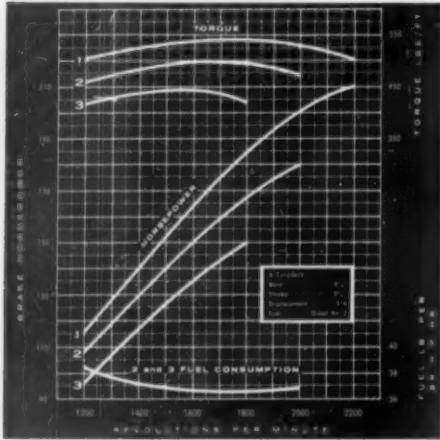
By ROBERT E. SCHULZ



The six-cylinder naturally aspirated Allis-Chalmers model 10000 open power unit. Both the 10000 and 11000 are available as open or closed units.



Performance curves of the 10000 diesel above, and the 11000 below. They are corrected to 29.92 in. Hg and 60° F. Curve 1. Full throttle setting; 2. Intermittent duty; and 3. Continuous duty.



21000); clean operation is very noticeable as is the absence of smoke plumes at light to full loads. In the proving ground tests, even in sub-freezing temperatures, the engines demonstrated quick starting ability characteristics.

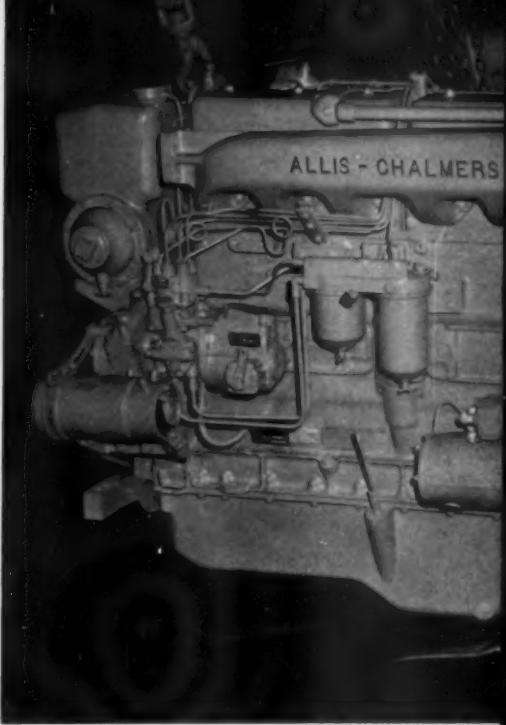
Open Combustion Chamber

Taking a closer look at the new engines, piston displacement on both models is 516 cu. in. with a compression ratio of 16.2:1. The 10000 in its fan-to-flywheel configuration weighs 1900 lbs. and the 11000, 1950 lbs. Based on the full throttle ratings, this gives the naturally aspirated engine a ratio of 13.10 lbs./bhp, and the turbocharged 11000, a ratio of 9.28 lbs./bhp. Dimensions are as follows for basic fan-to-flywheel engine:

	Length	Width	Height
11000	53"	29 1/4"	48 3/4"
10000	53"	28 "	47 3/4"

The 11000 at 2200 rpm, as a matter of fact, is right in the ball park of the on-highway diesel. Comment concerning this was not forthcoming from Allis-Chalmers officials.

The direct injection open combustion chamber system is the focal point design-wise of the new diesels and the real basis for the family theme that now pervades Allis-Chalmers thinking. Main objective with this system is to achieve controlled turbulence for thorough mixing of fuel and air. This according to Allis-Chalmers engineers, provides complete, fast and even combustion and the end result—low fuel consumption. The design of this system is illustrated in cross section. In particular, note the mask on the inlet valve to induce swirling motion of the incoming air, and the deeply recessed piston which intensifies the swirling motion on the compression stroke and squishes

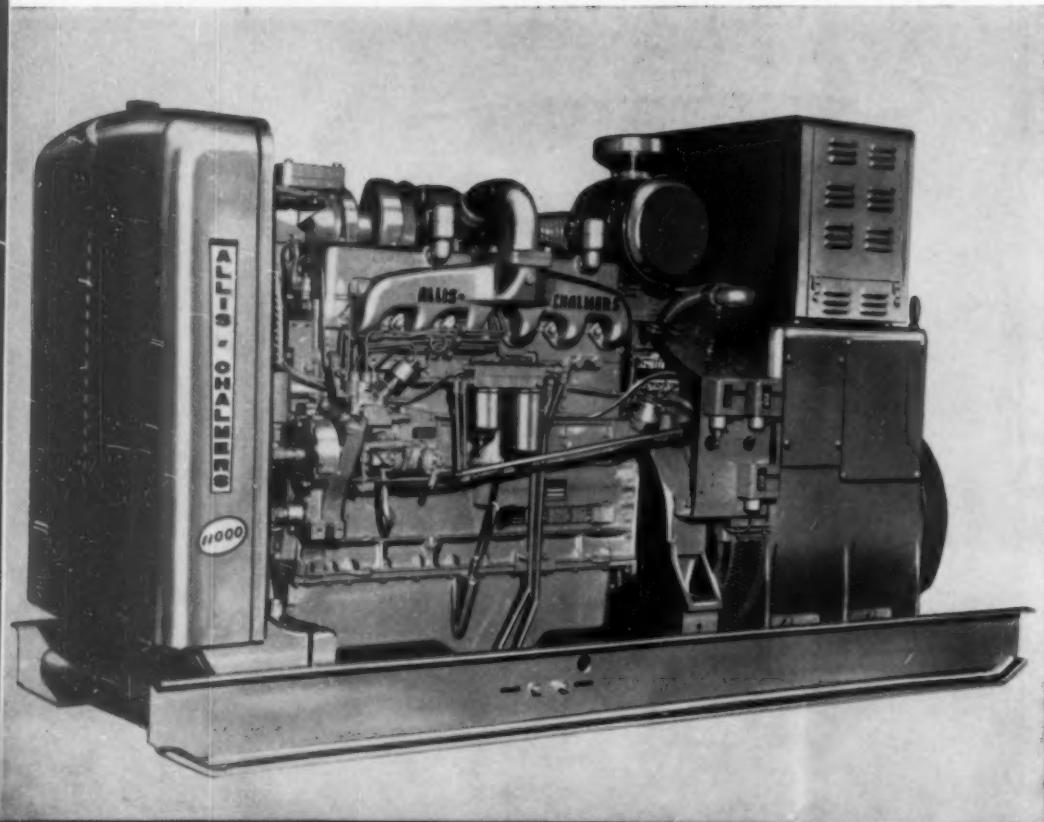


air toward the center. This imparts additional rolling motion and increases turbulence and air velocity. This action, together with the good breathing characteristics of the engine, are primarily responsible for the low fuel consumption. Power curves for both engines are illustrated. Note that three ratings are shown. 1. Represents the power available at full throttle for engines to be installed in off-highway rubber tired equipment, in excavators and cranes, for standby generator sets, light duty marine, etc. 2. The recommended power for generator sets, rock crushers, asphalt plants, sawmills, etc.; and 3. is the recommended power to be used for driving sustained loads for 24 hr./day operation.

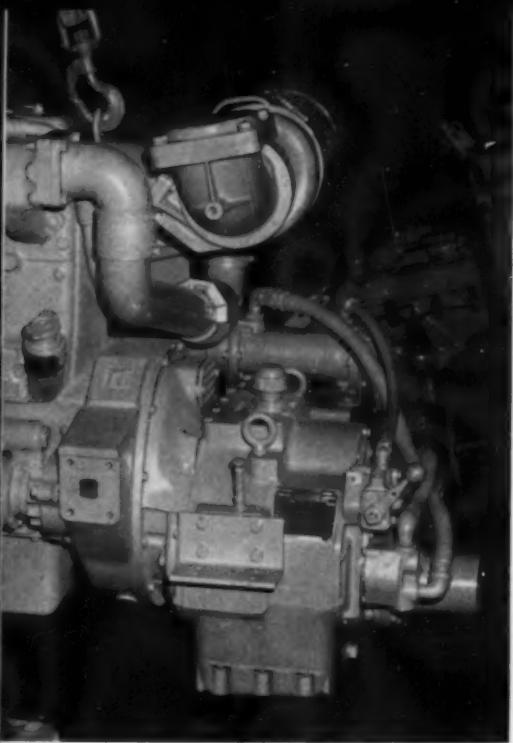
Two Valve Design

An American Bosch fuel injection pump is used on both of the engines and it supplies fuel to Robert Bosch nozzles at 2500 psi. Four hole nozzles with openings of .012 are used on both the 10000 and 11000. The fuel oil filter is mounted directly below the intake manifold and a lube oil filter and oil cooler is positioned under the exhaust manifold. Dual filters are provided on the 10000 and 11000 above 1800 rpm. A Schwitzer turbocharger is used on the 11000; it is center mounted on the industrial engines and rear-mounted on the marine diesel. A radiator type bypass cooling system is used on both engines with the water pump gear-driven from the camshaft. A 24 volt electrical system is standard with the starter, generator and regulator supplied by Delco-Remy. Both air and hydraulic starting motors are available as optional.

The new engine is designed with one inlet and one exhaust valve and take alloy-steel valve seat inserts. To achieve the required directional flow of air, the inlet valve is keyed and restrained



Skid-mounted, self contained 11000 diesel electric set is available to 110 kw. Allis-Chalmers brushless type generators are offered on both the 10000 and 11000.



from rotating. Double springs, oppositely coiled, relieve stress on the valve stem. Valve seats are water cooled and the injection nozzle, set in a stainless steel sleeve, is also encompassed with water. The rocker arm assembly is of the button type using simple barrel type lifters so that the only load on the camshaft comes from the valve

springs. The cylinder head is made in two sections — each serving three cylinders and the top covers can be easily removed for access to the injector nozzles and rocker arms.

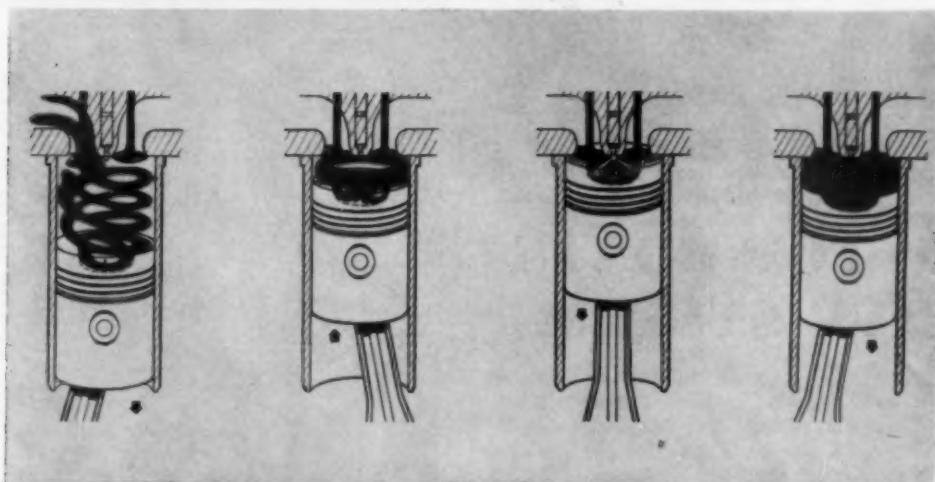
Marine version of the model 11000 with rear mounted Schweizer turbocharger and Twin Disc MG 521 reduction and reverse gear. Engine is rated 200 hp at 2200 rpm, and 150 hp at 1800 rpm. Starter and generator are 24 volt Delco-Remy.

Combustion system drawings show: 1. Air coming into the cylinder on the intake stroke is given swirling motion by the directional mask on the intake valve; 2. Swirling motion intensified on compression stroke and air "squished" toward the center imparting additional rolling motion; 3. At point of maximum turbulence, fuel is injected at 2500 psi in four-jet pattern; 4. With fuel thoroughly mixed with air, combustion takes place.

The crankshaft is fully counterweighted and has precise static and dynamic balancing. It has seven main bearings with $3\frac{1}{2}$ in. main journals and $2\frac{3}{4}$ in. connecting rod journals. Connecting rods are balanced with an "I" beam section and are rifle-drilled. Piston pin is of the full floating type employing snap retainer. Pistons are heavy walled aluminum, cam ground to insure desired fit in the cylinder at operating temperatures. Each is fitted with four rings—three compression, one oil, and the top ring is chrome faced and fitted in a Ni-Resist iron insert. The pistons travel in alloy iron, replaceable cylinder liners of the wet type built with O ring seals at the bottom. The block itself is cast of high tensile, nickel alloy iron and is ribbed internally so that the stress is carried on the inside of the block through a column of iron.

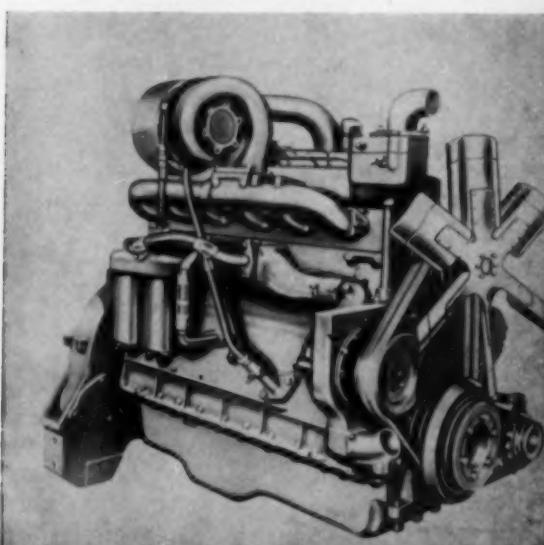
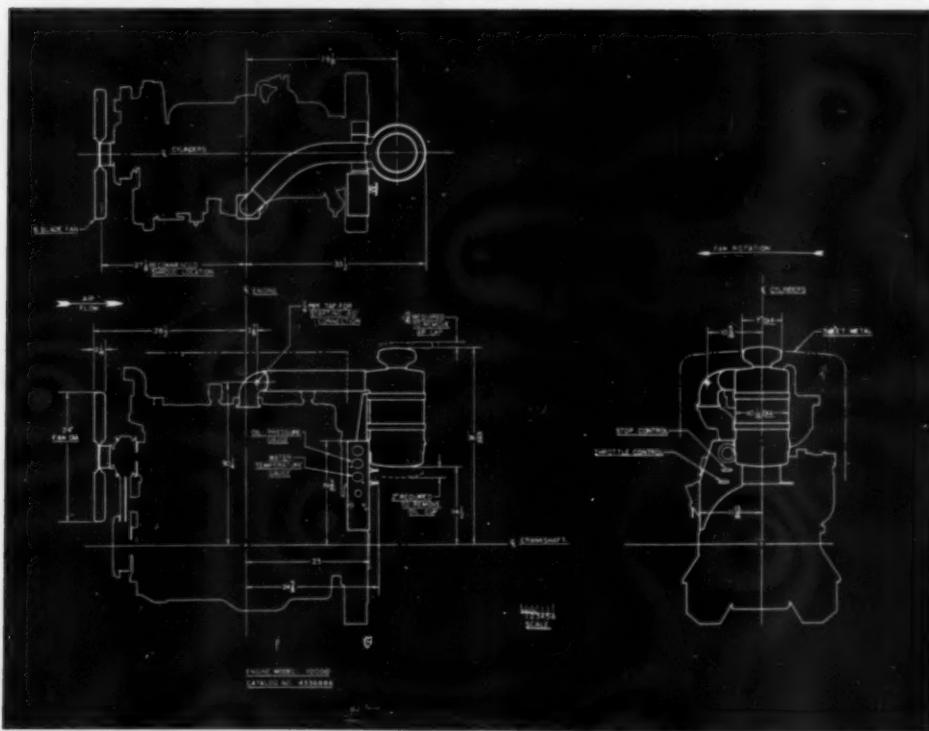
An SAE #1 flywheel housing and flywheel is standard on both industrial type engines to accommodate a range of clutches and torque converters. An SAE #2 flywheel housing is standard on the 11000 off highway engine. On other than fan-to-flywheel engines, Allis-Chalmers makes available skid-mounted, open or closed power units and complete, self-contained diesel electric sets. The 11000 diesel electric set is available to 110 kw, and the 10000 to 66 kw. Both are equipped with generators and controls built by Allis-Chalmers.

While no specific comment is available, it is readily apparent that these new diesels (including the 16000 and 21000) are a firm beginning to what eventually will be a completely new family of Allis-Chalmers engines. In our September, 1960 issue, we described the start of construction of a new multi-million dollar engine plant at Harvey. Now under roof and moving rapidly towards completion, it is strong evidence of the progress at Allis-Chalmers and within the industry generally.



Dimensional drawing of the Allis-Chalmers model 10000 fan-to-flywheel diesel. Turbocharged 11000 is 1 in. higher from center-line.

Exhaust manifold side of model 11000 engine shows dual lube filter arrangement and positioning of turbocharger.





6500 HP DIESEL TOWBOATS HAVE NEW DRIVE SYSTEM

By ROBERT E. SCHULZ

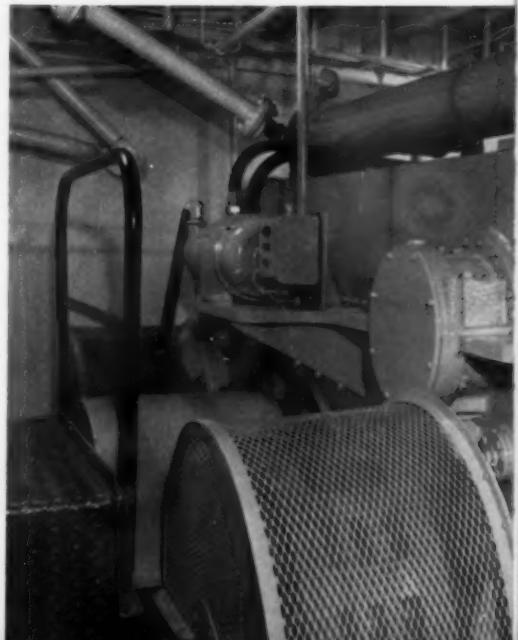
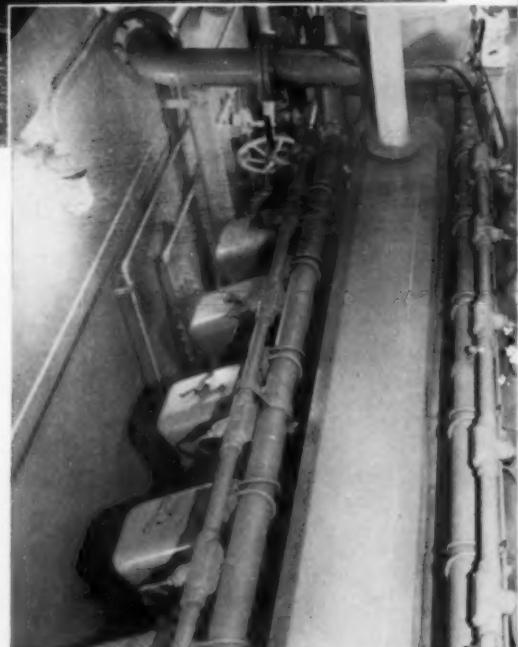
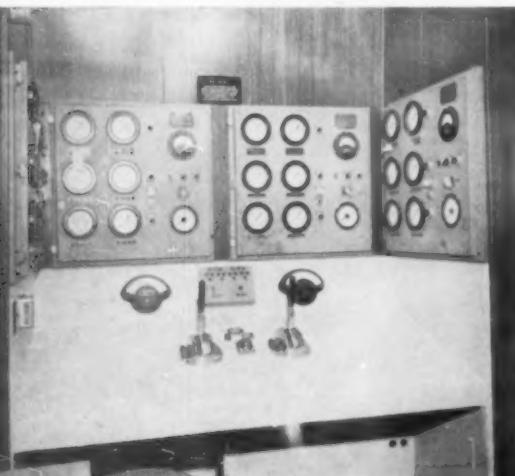
LOUISVILLE, Ky. December 6—The River gained another super towboat as the 6500 shp M/V *Patrick Calhoun, Jr.* was christened here today in a rain and fog-abbreviated ceremony. But the weather did not dampen the enthusiasm attached to this event nor the importance attached to this new vessel, the first of two sister

towboats built by Jeffersonville Boat and Machine Co. for its parent company, American Commercial Barge Lines. The second boat, M/V *J. E. Alquist*, will follow the *Calhoun* into service in 30 days. Each of the new 190 ft. twin screw towboats is powered by four Alco 1655 shp diesels which in pairs drive through Western twin pinion reverse-reduction gears. This is the first drive arrangement of this type on the inland waterways. Our January issue in the article "What's New In Towboats For 1961" presented a brief, advance description of the *Calhoun* and its power. Now let's look at the vessel in greater detail emphasizing the drive and control system.

The air-conditioned and soundproofed control room located in the engine room on the main deck level. A single lever Westinghouse Air Brake control is provided for each pair of engines with separate gauge panels for each Alco diesel. Pyrometer is Alnor and tachometer is Weston.

Western twin-pinion PCMR reverse-reduction gears are installed, each equipped with four Wichita air actuated clutches. This four engine-twin screw arrangement is unique to river towboats and provides flexibility of drive and speed.

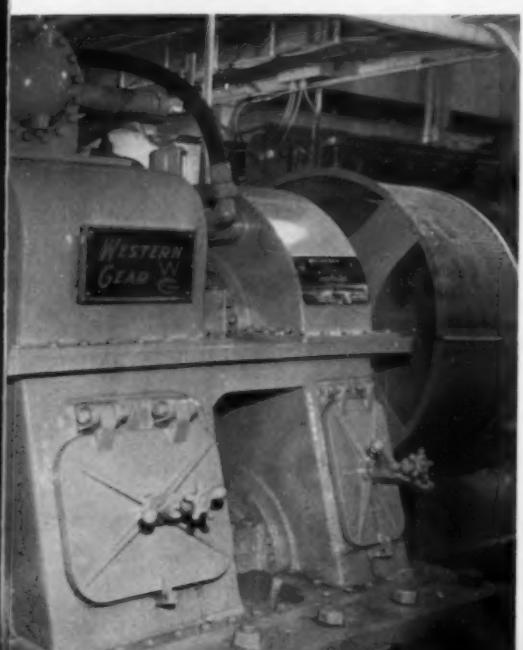
DIESEL AND GAS ENGINE PROGRESS



The two new boats, twice as powerful as any boat in Commercial Barge Lines fleet, are Jeffboats' hulls No. 1000 and 1001. They are capable of pushing as much as 40,000 tons at one time, the equivalent of 800 railroad freight cars. Operating mainly on the Lower Mississippi, they will make the trip from St. Louis to New Orleans in 5 days and the return trip against the current in 10 days. The optimism for the boats prevalent at the ceremony was probably best expressed by Indiana Senator Homer E. Capehart when he said, "It is my ambition to see as many boats on this river

The *Patrick Calhoun, Jr.*, as it moved to the Louisville wharf for the christening ceremonies. A sister towboat, the M/V *J. E. Alquist* will join the company in early 1961. Both vessels were built by Jeffboat for American Commercial Barge Lines.

Engine room looking forward from the main deck down on two of the four 1655 turbocharged 12 cylinder Alco propulsion diesels.



as on the Rhine River in Germany. Population growth will result in a tremendous need for increased river transportation and nothing must be allowed to retard the development of the Ohio and other rivers."

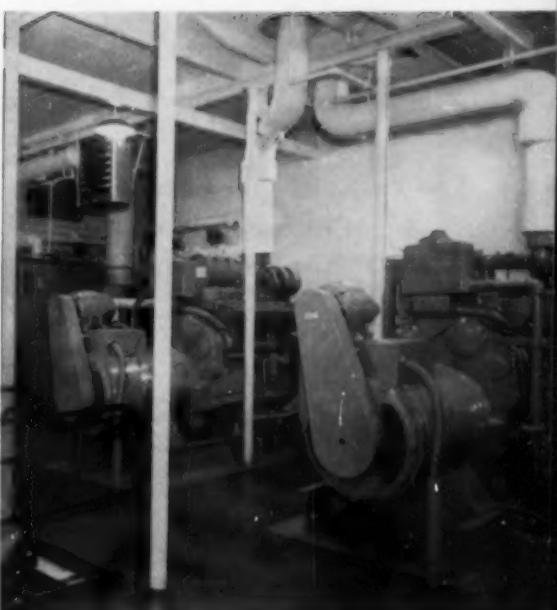
Painted in ACBL's traditional black and white, the *Patrick Calhoun, Jr.*, rising four stories above the water line, was a very impressive sight. It was named in honor of founder and retired board chairman of American Commercial Barge Lines. From the bottom of the vessel's pair of Kort nozzles and its rudders 9 ft. below the water line, to the top of its pilot house 40 ft. above the water, the *Calhoun* has been designed and built for maximum towing efficiency and economy of operation. It has an overall length of 190.5 ft., a beam of 48 ft. and a depth amidship of 12 ft. The vessel has a spoon-type bow and a double-chine midbody which fairs cleanly into the stern lines to the pair of stainless steel-clad nozzles and the 10 ft. dia. stainless steel propellers. With a normal supply of fuel and stores aboard, the boat, as stated, draws 9 ft. When fully fueled with 170,000 gals. the draft will be 10 ft. There are six rudders of airfoil section, two aft of the propellers for steering, and four forward of the propellers for backing and flanking. The steering and flanking rudders are operated by two separate hydraulic ram steering engines.

Now to the power plant and control system. Propulsion is delivered by four 12-cylinder turbocharged Alco four-cycle diesel engines, model 251. These are V-type, each with a continuous rating of 1655 hp at 1000 rpm; however the engines have an intermittent rating of 1800 hp, meaning that a total of 7,200 hp is available for short periods. The engines are arranged two to each propeller shaft and drive through twin-pinion, model 112 PCMR reverse-reduction gears built by Western Gear Corp. Each gear is equipped with four Wichita air clutches. Gear ratio is 5.55:1 for ahead rotation, while a ratio of 5.26:1 astern permits development of full backing power. An interesting feature is that each engine drives through a $\frac{3}{8}$ in. dia. quill shaft directly connected to the engine flywheel and each input pinion of the reverse-reduction gear.

Each engine is equipped with a solenoid-operated air starting valve which admits 80-150 psi starting air to the Ingersoll Rand air starting motors. Also engine mounted are the cooling water pumps, lube oil pumps and fuel oil booster pumps.

The pilot house console contains complete controls for the main propulsion diesels and control is through a Westinghouse Air Brake system with a duplicate station in the engineer's control room. Set-up here is similar to other large boats in that the engineer at any necessary occasion can take control of the engines away from the pilot. The control room itself is located in the engine room on the main deck level and is air-conditioned and soundproofed. From this station, the engineer can start and stop the main engines and take most of the normal log readings from panels provided for each of the four engines.

The Westinghouse pneumatic controls are so arranged that an engine may be started while the



Looking aft in the engine room. Shown are the two Caterpillar D353-C diesel generator sets, each rated 200 kw. Switchboard in the background is of the free-standing, dead-front type.

other engine on the shaft is running, and engaged to the propeller by simply returning the speed control handle to neutral and then advancing to whatever propeller speed is desired. These controls also permit operation of only one engine per shaft while the other is undergoing maintenance, or during periods of low power requirements. If one engine must be stopped in an emergency, it is automatically declutched through the Wichita units and the other engine continues driving. Load is balanced by a simple adjustment in the air control system linked, of course, to the Woodward pneumatic governor.

The ship's service generators and switchboard are located on the main deck aft in the engine room. These generators, each driven by a Caterpillar diesel engine model D353-C, are rated at 200 kw, 440 volts, 60 cycles, 3 phase. One generator has sufficient capacity to carry the full electrical load of the boat with the second as standby.

Principal Equipment

Engines	Alco
Engine controls	Westinghouse Air Brake
Reverse-reduction gears	Western Gear
Air tube disc clutches	Wichita
Governors	Woodward
Intake air filters	Air-Maze
Exhaust silencers	Maxim
Lube oil filters	CFC Michigan
Lube oil strainers	Nugent
Fuel oil filters	Briggs
Fuel oil centrifuge	Sharples
Lube oil transfer pumps	Roper
Lube oil pumps (r&r gears)	Tuthill
Tachometers	Weston
Air compressors	Quincy
Pyrometers	Alnor
Auxiliary generators	Caterpillar

WHITE'S MATCHED GAS ENGINE-COMPRESSOR UNITS

Units Represent the Economic Trend to More Compact Compressors With Piston Speeds, Gas Velocities Not Exceeding Established Slow Speed Practices

A LINE of medium speed, balanced-opposed compressors for gas gathering, lifting, compressing, and booster service is being produced by the White Diesel Engine Division of White Motor Co. The compressors are designed in conformity to White Superior gas, diesel and dual-fuel engines.

The two-cylinder (W-62) and four-cylinder (W-64) compressors have been designed for continuous, unattended heavy duty service and have been engineered for direct drive with White Superior natural gas engines. Matched engine-compressor units are available from 200-1000 bhp operating at 600-900 rpm with the compressor using a 6 in. stroke. The two cylinder compressor covers a range from 200 bhp, with the Superior 6G-510 gas engine, to 635 bhp with the Superior 8G-825 gas engine. Rating up to 1000 bhp is available with the W-64 four-cylinder compressor and the 8GX-825 eight-cylinder supercharged natural gas engine. This provides one of the highest horsepowers available for this type of combination.

White Superior engine-compressor units represent an economic trend to more compact compressors with piston speeds and gas velocities not exceeding established slow speed practices.

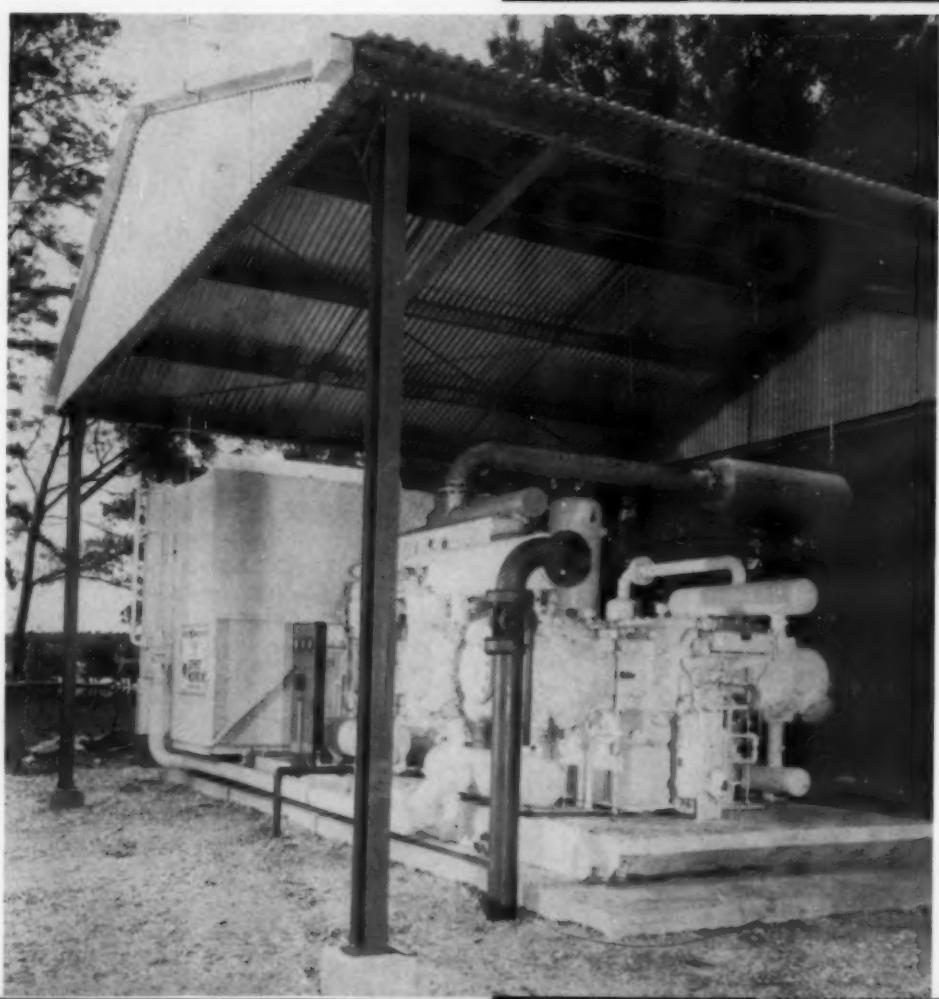
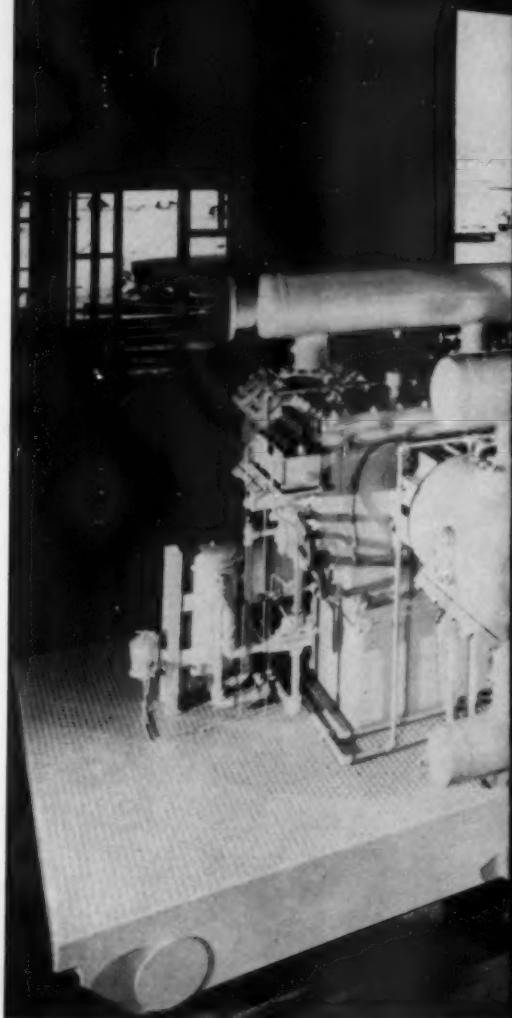
Rugged construction and simplicity of design is reflected in White W-62 and W-64 compressors. The compressors are designed and manufactured at the Springfield, Ohio plant where White engines are also built.

The compressors are of the balanced-opposed type and are produced in two and four cylinder models. Sixty-eight standard cylinder sizes range from 4,000 psi with the $2\frac{1}{8}$ in. diameter cylinder to 85 psi in the $22\frac{1}{2}$ in. diameter cylinder. These cylinders mount interchangeably in any combination on both two and four cylinder compressors.

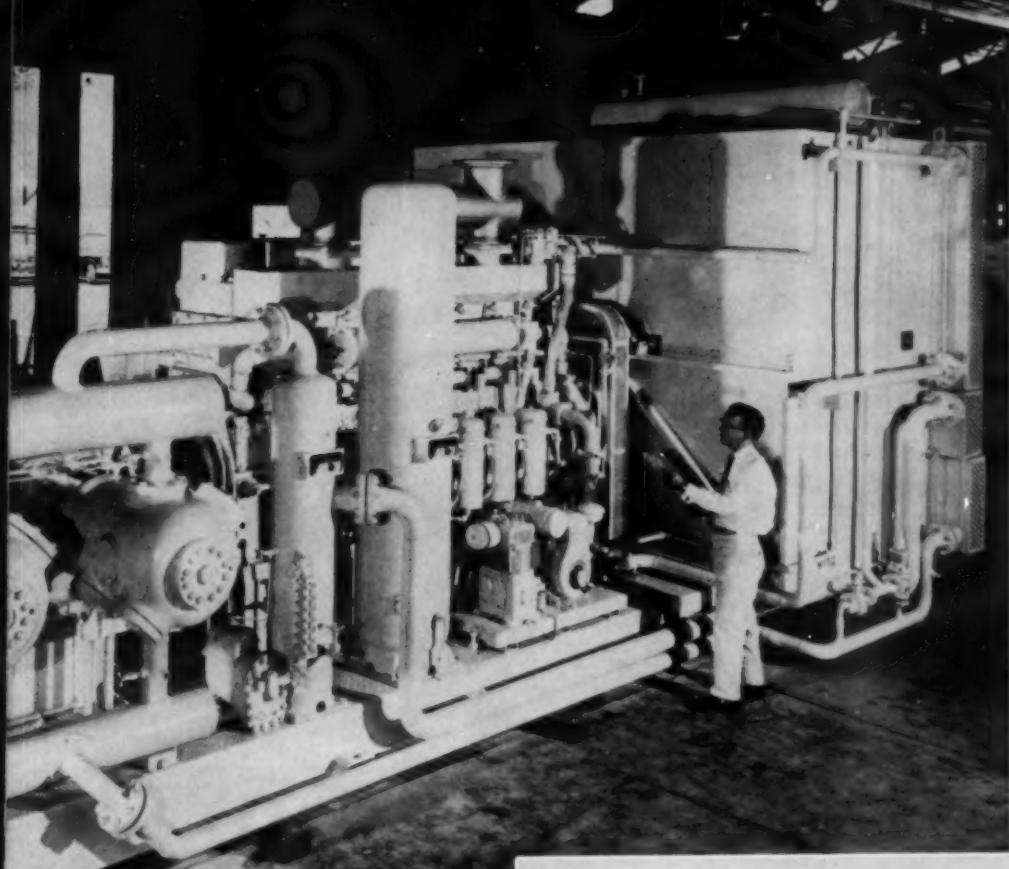
Several outstanding features of the compressors have been pointed out by officials of the company. Belt drive is eliminated because the engine and compressor are directly coupled and turn at engine speed. In this way, restrictions on engine speeds are removed. Speed of the direct-connected engine can be varied from 600 to 900 rpm to control compressor output. Since the engine can run at opti-

mum speed instead of at a lower speed adapted to compressor piston speed, a yield of greater horsepower can be had from an engine of the same weight and size. The compressor cylinders may also be easily changed on the same frame to suit changing volume or pressure.

Another feature of White compressors are their power load capacities—a maximum rod load of 25,000 lbs. Both the natural gas engine and compressor are designed by White engineers for heavy duty operation and will handle continuous operating loads and temporary overloads. Fatigue-proof split steel backed precision bearings on the compressor main and connecting rods are interchangeable with White's heavy duty diesel and gas engines. If required, other equipment, such as water pumps, aerial coolers, etc., can be driven by an auxiliary drive shaft on the compressor. The heavy duty balanced-opposed crankshaft is rifle drilled for pressure lubrication and has a lifetime oil seal on the power input end. The crankshaft's large diameter assures rigidity and provides a large bearing area.



The White Superior four cylinder compressor, skid mounted for continuous and unattended operation at the station near Hull, Tex. The model W-64 compressor is driven by a White Superior 8G-825 natural gas engine rated 635 bhp at 900 rpm.



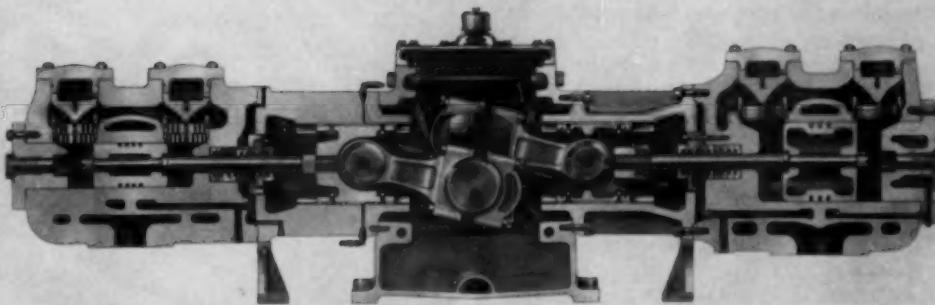
White engine-compressor skid mounted unit during final inspection prior to delivery. Both engine and compressor are equipped with Winslow lube oil filters. Note Quincy starting air compressor.

Extra heavy duty parts such as crankshaft and ribbed castings in the compressor frame are used. The frame is reinforced against all operating stresses. Extra rigid connecting rods and forged alloy steel piston rods contribute to the ruggedness of the compressor. Rigidity of bearing caps is assured through use of four connecting bolts. Connecting rod cap are also of four bolt design.

Ease and speed of servicing is another feature of these compressors. Crossheads are removable through the side of the crosshead guide without disturbing the cylinder mountings. Crosshead shoes are replaceable and have special design for maximum lubrication. The crankshaft is removable through the top of the frame simply by removing the top cover of the frame and extra large spacer bars and tie bolts. Crosshead guides are of alloy iron. The guides are designed with multiple external reinforcing ribs and are rigidly bolted to the main frame. Large side openings in the guide permit easy access to crossheads and com-

Cross section view of White Superior four cylinder compressor, balanced-opposed type. Note rugged construction of integral parts.

Shown on a recent visit to the Hull, Tex., installation are, from left, W. F. Burrows, vice president, general manager; J. H. Newton, sales manager; and C. L. Benedict, compressor and engine sales engineer, all of White Diesel Engine Division, and Robert P. Ramsey, engineering and marketing consultant. Installation was made for Liberty Gas Transmission Co., by Southwest Industries, Inc., Houston.



pressor piston rods. The high strength alloy iron base is matched to engine, ribbed and reinforced for maximum rigidity. Line-bored main bearing supports assure crankshaft alignment and extra long spacer bars further enhance rigidity.

A gear type lube pump provides full pressure lubrication for all parts in the frame including main and connecting rod bearings, crossheads and crosshead pins. The lube oil pump and four speed lubricator, including drive gears for both, are easily removed as separate units without disturbing the end cover. All of these features reduce costly down time.

The compressor is equipped with a Winslow full-flow lube oil filter, McCord force feed lubricator and Air-Maze crankcase breather. Engine-to-compressor connection is by means of a Thomas flexible coupling.

NEW FEATURES MARK CAT'S 245-460 HP DIESEL

By ROBERT E. SCHULZ

PEORIA, Illinois—The Engine Division of Caterpillar Tractor Co. has taken the wraps off the latest in its new line of high output, turbocharged and aftercooled diesels. This is the D343, a six cylinder power plant that, like other recent additions, is totally new with many features—some unique to the industry. Rated up to 460 horsepower at 2000 rpm, the D343 is the largest of the new series and it is also an economy leader with a minimum fuel consumption of .390 lbs/bhp/hr at 1600 rpm. Here at the Engine Division's Moline plant outside of Peoria, I discussed the new diesel with engineering and sales officials and it is readily apparent that the D343, with its wide range of applications, is going to figure very prominently in the company's overall marketing and sales program.

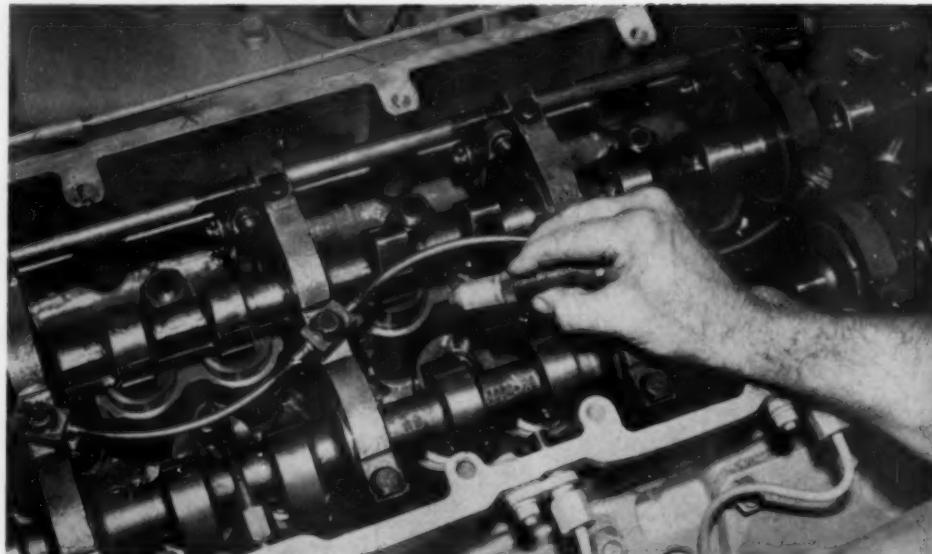
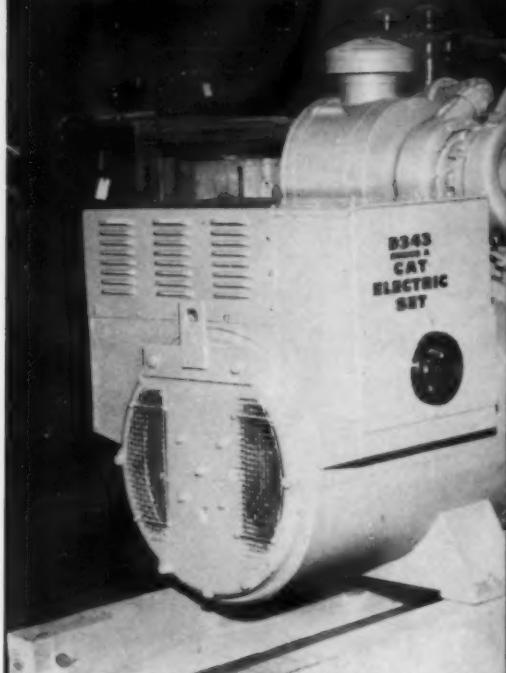
The D343, as stated above, is a six-cylinder, four cycle diesel with a 5.4 in. bore and 6.5 in. stroke, turbocharged and aftercooled, and rated at 2000 rpm as follows:

(Marine)
Turbocharged, with raw 85° water to aftercooler
Maximum 460 bhp
Intermittent 415 bhp
Continuous (at 1800 RPM) 325 bhp
(Industrial)
Turbocharged, with jacket water to aftercooler
Maximum 420 bhp
Intermittent 375 bhp
Continuous (at 1800 RPM) 300 bhp

Also available with turbocharger only, the D343 in this version has a maximum rating at 2000 rpm

of 360 bhp, intermittent is 315 bhp, and continuous, 245 bhp at 1800 rpm. Piston displacement of all models is 893 cu. in. with a compression ratio of 16:1. Caterpillar's move to higher bmepl that characterize all of its recently announced diesels is continued. As an example, the D343 with turbocharger and jacket water to aftercooler is rated at 186 bmepl.

While new in many important ways, the diesel retains Cat's established precombustion chamber.

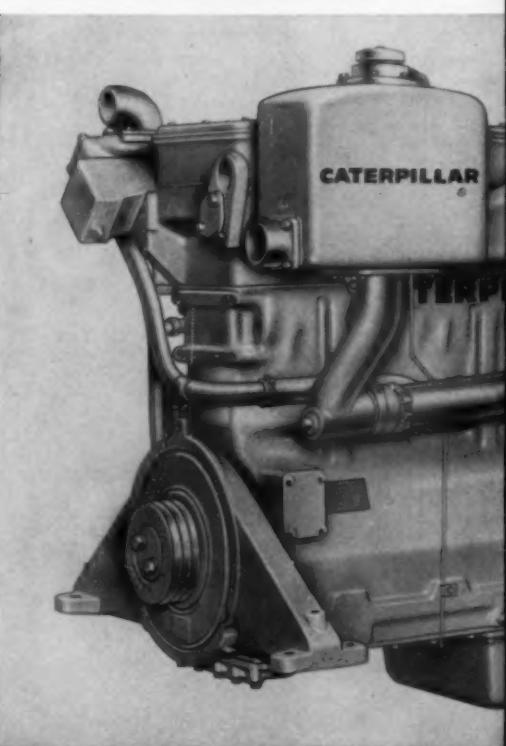


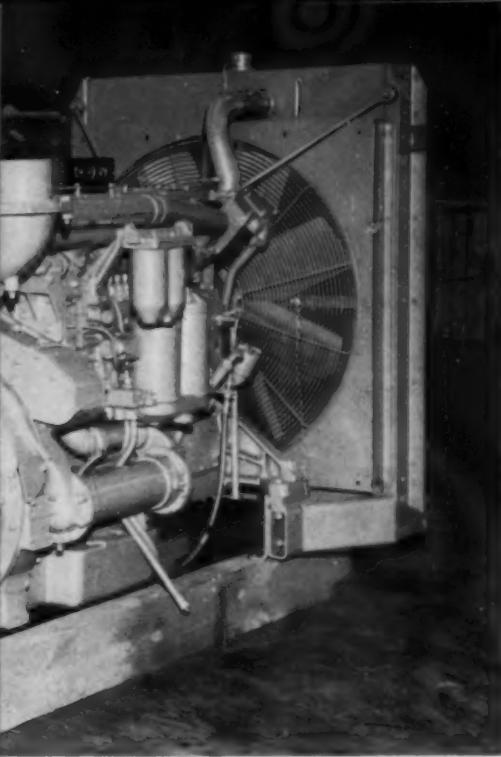
Inserting the pre-cup. View shows the two overhead camshafts arranged so that one operates intake valves and other, the exhaust valves. Weaving across the top of the housing is a shaft bearing lube line.

Marine version of the D343 diesel engine. With raw water intercooler the new engine is rated 460 hp max. at 2000 rpm. This unit is equipped with Twin Disc reverse and reduction gear.

Piston and connecting rod of the D343. Note heat plug in the piston crown, and three ring design, each of which are chrome-plated.

The precombustion chamber is located in the center of the head flanked by four valves, two intake and two exhaust. New is elimination of the rocker arm assembly by an overhead cam arrangement. The D343 also represents further refinement by Caterpillar in the area of turbocharging, specifically in the areas of better breathing and greater





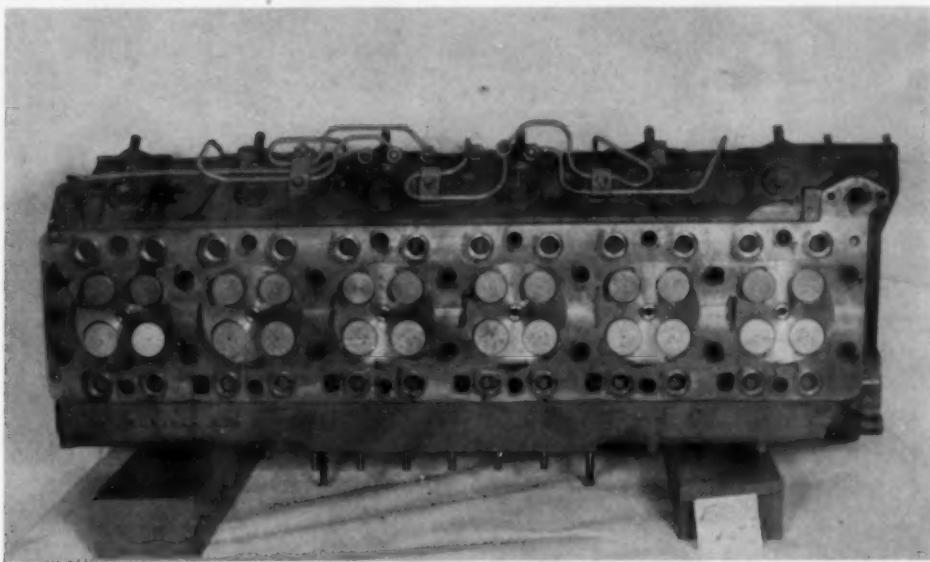
cooling efficiency. These and other features will be fully described later. Now let's direct our attention to the D343's application.

Has Wide Power Range

Talking with Manager of Manufacturer Sales Gene Sterrett, he pointed specifically to the unit's wide power range, namely 245 to 460 bhp, as a key factor in its adaptability to many applications. As an example, in the excavator and dragline field, the range of application would be 2½ to 4½ yd. units; in compressors, 900 to 1200 cfm; in dredges, 250 to 400 hp pumps; in industrial locomotives, up to 50 tons with a single engine-torque converter unit and 110 tons with two. The D343 is also offered in either open or closed type power units

D343 electric set, rated 200 kw continuous, 250 kw standby, is equipped with new static excited, static regulated generator.

Underside of the head showing position of the four valves and center location of pre-combustion chamber.



Timing gear arrangement for the D343. The top gear drives one cam-shaft which gear-drives the other cam-shaft.

for crusher, pumps, and other construction, oil-field and industrial drive applications. In its marine version, the engine is suited for larger pleasure craft, towboats, tugs and commercial fishing boats and similar craft.

With the introduction of the D343 electric set rated 200 kw continuous, 250 kw standby, Caterpillar is also announcing its new static regulated static excited generator. Put in the words of one of Cat's electrical engineers, the new SRSE generator is a fine example of the old saying, "He lifted himself by his own bootstraps . . ." In this set, as the generator is rotated by the D343, a portion of the alternating current produced by the generator is rectified or changed from alternating current to direct current by means of silicon diodes. This direct current is fed to the rotating field to

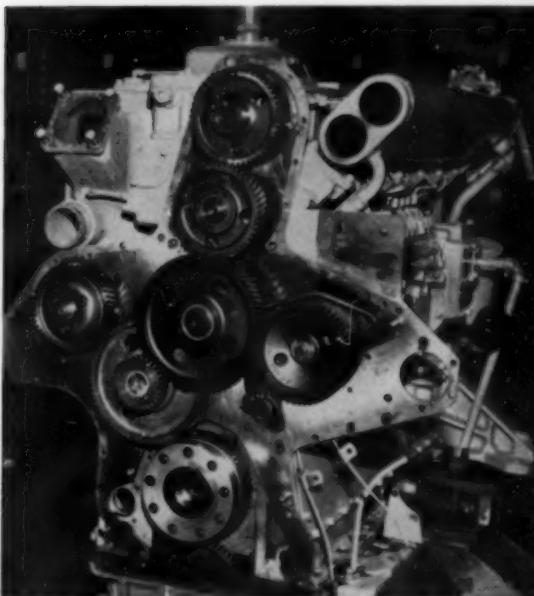
furnish the excitation power. A magnetic amplifier is utilized to control the excitation and thereby, the output voltage of the generator. Absence of the rotary exciter contributes to lower maintenance costs, and, according to Cat the new package provides very fast response to load changes, close voltage regulation, minimum of switchgear, and other operating and service features.

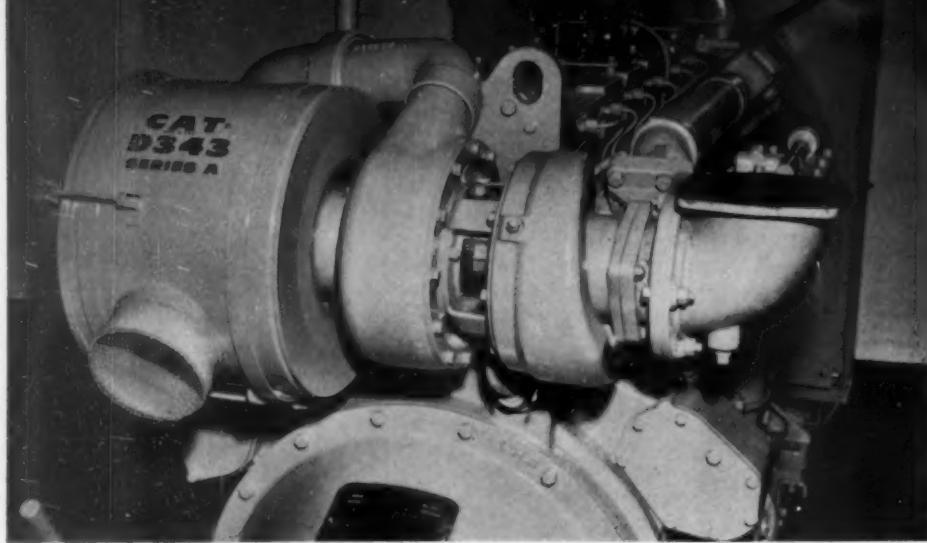
The D343 has been under development for about five years, the last two concerned primarily with its industrial configurations and applications. It was, from the beginning, designed as a turbocharged-aftercooled diesel with specific considerations directed to improved fuel economy and high power output at 2000 rpm. The power curve illustrated shows the work accomplished along these lines. Weight and size were kept down commensurate with the above objectives. Thus, with the exceptions of certain established components, it is new from the pan up. Let's look at the engine from this standpoint.

Overhead Camshafts

The D343 engine has overhead camshafts and four valves per cylinder. As illustrated, one cam-shaft is driven from the timing gears at the rear of the engine. This cam-shaft in turn gear-drives the other. The camshafts are so arranged that the one operates the intake valves and the other the exhaust valves, thus eliminating the need for any rocker or valve linkage. The cam follower, to my knowledge, is unique to the industry in that it provides for clearance setting through a simple adjustment set by a Phillips head screwdriver. The screw itself has a self-locking device. The precombustion chamber is located directly in the center of the head and a large, single-orifice nozzle is used, injecting vertically and impinging the fuel directly in the center of the piston chamber. Valves, of the rotating type, are set in the head at a very slight angle. Stellite is used on the faces and seats are hard alloy steel.

Much attention was focused on the breathing characteristics of the D343; the manifolding and





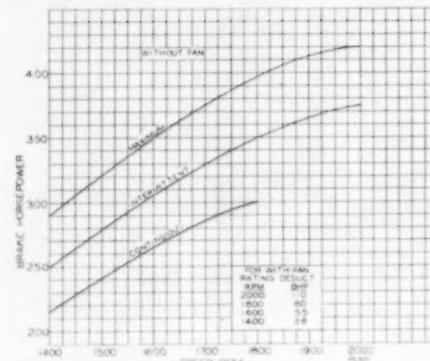
Closeup of Donaldson air cleaner, Garrett Airesearch T-14 turbocharger mounting arrangement on the industrial version of the D343 with power takeoff.

Dimensions, D343 marine engine.

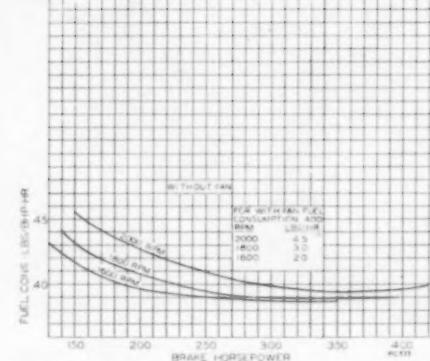
valve port arrangement are designed to take full advantage of the four valve system. The intake manifold is integrally cast as a part of the cylinder heads with a large, unrestricted opening provided from the aftercooler. On the exhaust side, a two piece manifold is used, each section serving three cylinders. Exhaust manifold is semi-tuned and the sections are joined with a piston ring connection joint to accommodate expansion. Also, a separate port is used from each intake and exhaust valve to its respective manifold, increasing airflow efficiency.

To achieve desired cooling efficiency and head strength, Cat has used a cast-in water shelf in the cylinder head. This divides the cooling water cavity into upper and lower chambers. With this design, the coolant flows at high velocity around the valve port walls and precombustion chamber with a scrubbing action across the lower surface of the head. In addition, this shelf construction imparts added strength to the head.

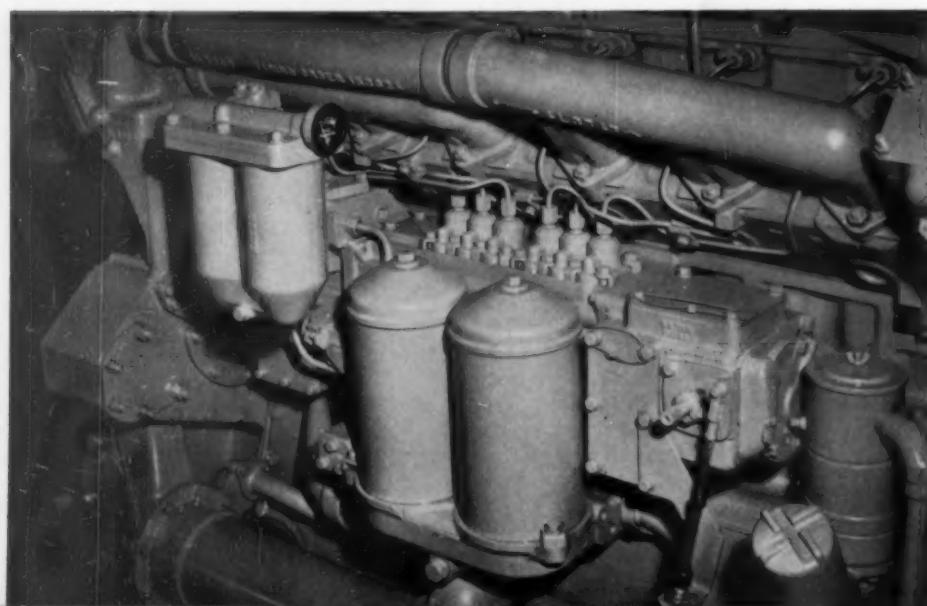
Closeup of the exhaust side showing the two piece manifold, mounting of lube oil cooler, fuel and lube filters and fuel injection pump.



Rating curve for the D343.



D343 fuel consumption curve.



The D343 turbocharger is flange-mounted on the exhaust manifold with its supporting member at the rear of the engine. The aftercooler is of the fin and tube type and mounts directly on the engine on the intake side. This turbocharger-aftercooler arrangement is similar to that used on Cat's recently introduced D320, D330 and D335 engines and the model 1675 truck diesel.

A cast alloy iron block is used for the new engine and to hold the line on weight, a certain amount of contouring has been done in the cylinder area. Wet sleeves are used as are aluminum alloy pistons. Elliptically ground, the pistons are also slightly tapered to the top. These low friction pistons take three chrome plated rings, two for com-

pression and one for oil control. The top ring rides in an integrally-cast iron insert. The crankshaft is of the seven bearing, forged steel type with 4.50 in. dia. main bearing journals and 3.54 in. dia. connecting rod journals. In each case, steel backed aluminum bearings are used. A viscous type torsional vibration damper is used on the front end of the crankshaft. Full pressure lubrication is used in the D343 with a constant oil jet spray cooling the pistons. This spray also lubricates the piston pins.

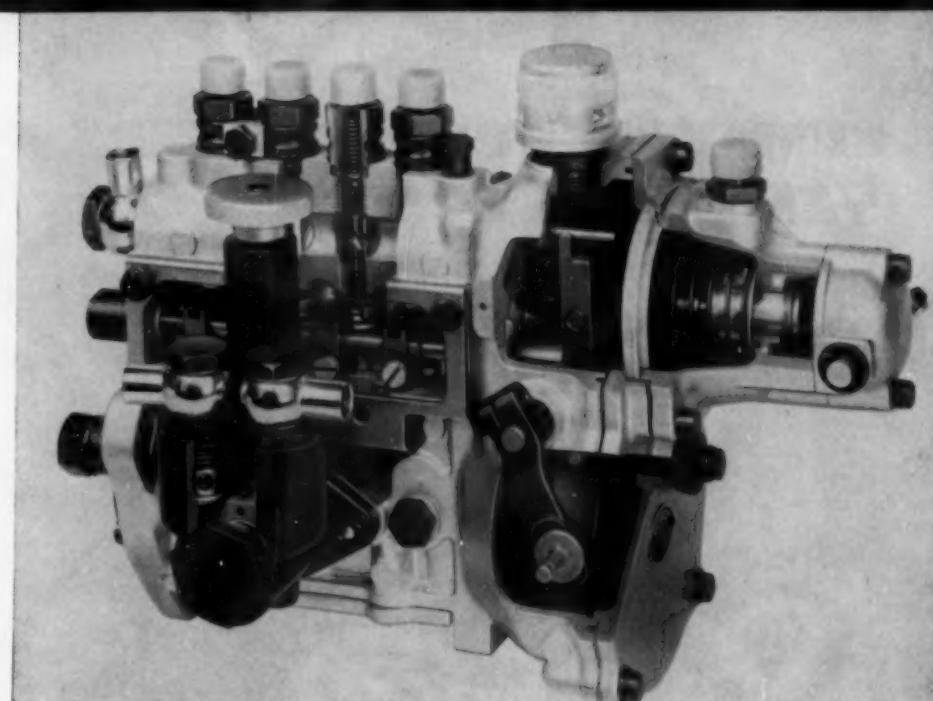
With the various models of the new diesels, Cat offers four starting systems; electric, hydraulic, air, and gasoline engine. A complete line of marine, electric, and industrial attachments are offered with the engines.

SMALL PUMP FOR HIGH RPM DIESELS

RECENT design trends in the smaller high speed diesel field point to increasing engine speeds and, often, higher injection pressures.

Consistent with this pattern has been the work of the fuel injection equipment manufacturers and in this article we deal with the newly developed "M" pump now being produced by the Robert Bosch Corp. This pump, smallest in the company's line, is designed for engines up to a displacement of 330 cu. in. in six cylinder models and to 220 cu. in. in four cylinder models.

Basically, the model M is of a configuration similar to the well established Robert Bosch "PE" inline injection pump family, but several improvements have been introduced coincident with design simplification. The pump housing is die-cast with the governor housing integral, and it is designed to accommodate either a mechanical or a pneumatic governor. Usually the M pump is equipped with the mechanical variable-speed RSV governor (see Oct. 1960 issue) and application engineering in this country has been along this line. The old arrangement of base plugs has been superseded by a base cover plate. Where formerly metering control was through a control rack and gear segment arrangement, this is now achieved by



Cut-away of new Robert Bosch pump showing simplification from previous in-line pumps. Unit is that produced for Mercedes-Benz 190 D passenger car and is equipped with pneumatic governor.

a control rod connected to the pumping elements by links. Height has been reduced so that spacing between elements is only .95 in. and height of the pump proper is 6½ in. Height reduction was achieved by elimination of tappet adjustment screws and element timing is attained by selection of proper tappet roller diameters. Also pumping plungers have center relief holes and helical slots instead of milled helices. Robert Bosch engineers state that this design reduces radial pressure on the plungers and accomplishes longer plunger life.

The M pump, like others in the Robert Bosch line, is built in-line, four and six cylinders, with a

separate pumping element for each cylinder as shown in the illustration. They are applied to some diesels now in production with over 4000 rpm engine speed, and according to company officials, test experience shows even higher speeds are practical with the pump.

WITH forty-two exhibitors already assigned space and advance registration surpassing all previous records, the upcoming Mississippi Valley Association meeting appears ear-marked for success. Officially designated as the 42nd Annual Convention and Waterways Exposition, it will be held at the Chase Hotel in St. Louis, February fifth through the seventh.

As a new and continuing feature, this year's meeting will have technical sessions which will answer the many facets of "What's Best in Your Particular Application?" The subjects to be discussed at this year's meeting will cover the fields of marine insurance and terminal facilities.

Switching attention to the Exposition, a check of exhibitors shows that 17 diesel engine builders and equipment manufacturers will have displays. Included in the group of engine builders are Allis-Chalmers, Caterpillar, Cummins, Detroit Diesel, Cleveland Diesel, Fairbanks-Morse, Nordberg, Waukesha and White Diesel.

Registration for the meeting will commence early Sunday, Feb. 5th in the Exhibit Hall area with exhibits themselves opening at 10 a.m. that day. According to an MVA official, 25,000 sq. ft. of exhibit space will be used and 3,000 key people in the waterways industry are expected for this important 1961 meeting.

RECORD MVA MEETING IS EXPECTED

View of exhibit hall during a previous MVA Convention



CUMMINS UPS HP, KEEPS SAME SIZE IN NEW V12'S

HOW do you redesign an already popular engine to produce more horsepower into the same size package without changing the versatility of the engine itself?

Cummins engineers faced this problem in preliminary work on their V-12 engines and have now come up with two units that pack more power into the same overall dimensions, but with relatively minor increases in the weight of the overall engines. At 525 and 700 horsepower, the engines represent significant advances in high speed units of their size.

The new models are the Turbodiesel model VT-12-700 and its naturally aspirated partner, the V12-525. Both engines are refinements and modifications of their predecessors, the VT-12 and the NVH-12, and incorporate many of the new design features that Cummins made part of the V8-350 and VT-430 series announced and described in our April, 1960 issue. The new 12 cylinder units are slated for the large off-highway earthmoving equipment and haulers, oil field work in such areas as well servicing, drilling, etc., marine, stationary power application, including generator sets.

How do the new 12 cylinder models line up with

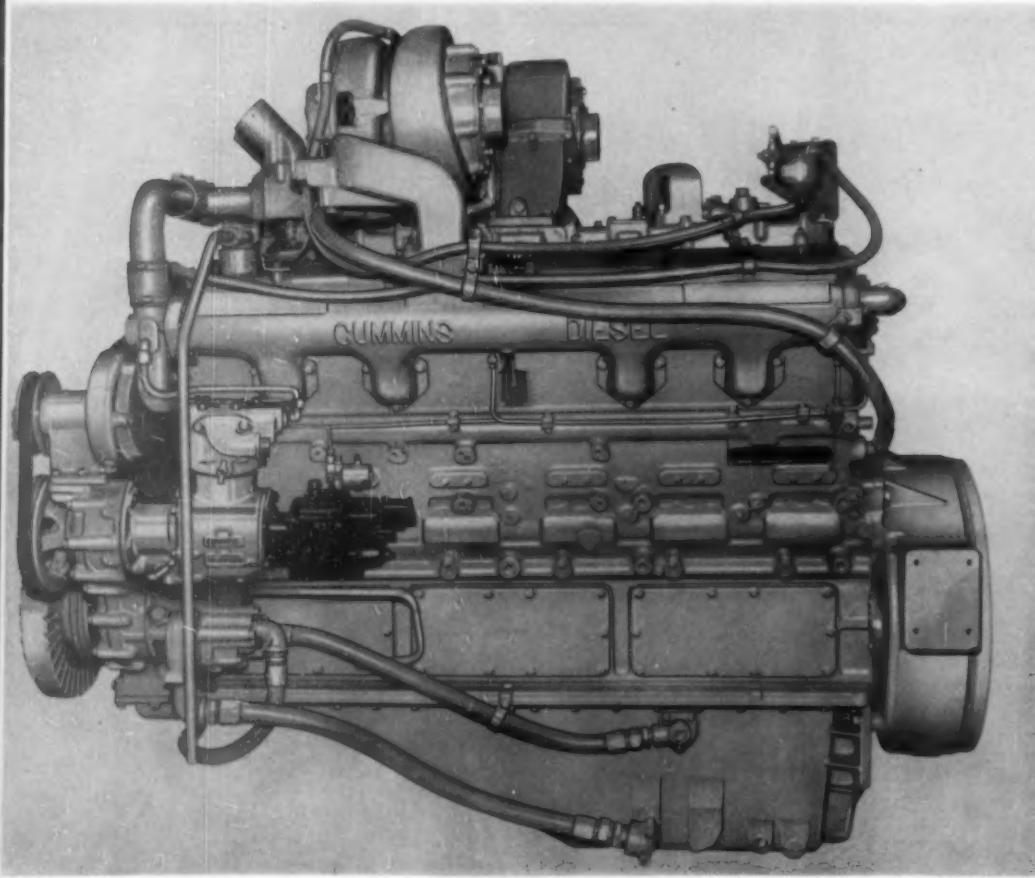
their immediate predecessors? Let's take a look at some basic statistics for a partial answer:

	NVH-12	V12-525	VT-12	VT12-700
Rated horsepower	450	525	600	700
Governed rpm	2100	2100	2100	2100
Displacement (cu. in.)	1486	1710	1486	1710
Torque at governed rpm	1125	1310	1500	1750
Peak torque	1230	1445	1635	1925
Peak torque rpm	1500	1500	1500	1500
Bmep at rated hp	114.2	115.5	152.2	154.1

In looking at these horsepower increases it's notable that they were achieved with only a 50 lb. weight increase (to 5200 lbs.) in the case of the V12-525 and only 90 lbs. (to 5700 lbs.) for the VT12-700. And, as stated, external dimensions are all but unchanged: $7\frac{3}{8}$ in. long $\times 49\frac{1}{4}$ in. wide $\times 54\frac{7}{16}$ in. high for the 525 hp model (the only change here is an additional $\frac{1}{8}$ in. in the width) and the same $7\frac{3}{8} \times 44\frac{3}{16} \times 60\frac{7}{16}$ measurements as the older VT-12 for the turbocharged 700 hp version.

The major part of the increase in horsepower in

New Cummins Turbodiesel VT12-700 engine. Engine is rated 700 hp at 2100 rpm, naturally aspirated version is rated 525 hp, also at 2100 rpm.

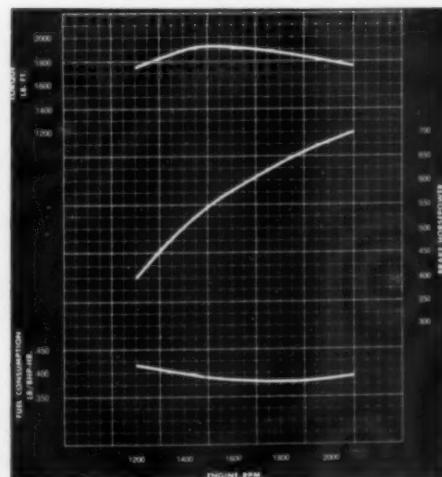


the new 12 cylinder engines can be found in two places: increased bore diameter (the stroke is unchanged), and increased intake and exhaust valve diameter with a consequent increase in valve area/cylinder.

Bore diameter of both the V12-525 and VT12-700 has been increased to $5\frac{1}{2}$ in., $\frac{3}{8}$ in. greater than the older model. The stroke is unchanged at 6 in. The greater bore diameter, of course, increases the piston displacement: from the old 1486 cu. in. to 1710 cu. in. Compression ratio, with larger bore and same stroke, decreases from 15.50:1 to 14.10:1 in the naturally aspirated version and was boosted from 14.00:1 to 14.10:1 in the turbocharged models.

Each aluminum piston has three keystone type compression rings and an oil control ring. Each cylinder has two intake and two exhaust valves, both types of $1\frac{1}{8}$ in. diameter. These new valves are $\frac{1}{8}$ in. wider than those in the older engine and the 14.3 per cent increase in valve area permits better breathing for increased power. With

Power curve, VT12-700 engine.



DIESEL AND GAS ENGINE PROGRESS



One of early applications of VT12-700 engine was in this KW-Dart model 95-EDT, 95 ton payload capacity ore carrier. Engine drives through Clark single stage torque converter and four speed powershift transmission, Spicer main drive shaft and a KW Dart triple reduction drive axle, double reduction carrier. Engine is equipped with Lubefiner oil filters.

previous models, with lower seals smaller than the top block bore to allow the "O" ring to pass through without twisting or damage, an improved steel carrier type gasket; hardened timing gears and reinforced cylinder block, with steel back bushings, instead of ball bearings in previous V12s, in the fuel pump drive, generator drive and idler gear. The new water pump is belt driven and is mounted above the gear cover. The pump outlet connects into the front of the cylinder block and is tightened by an adjustable pulley. The lube oil pump has been redesigned as a smaller and lighter unit and has been relocated behind the gear housing instead of on the front of the engine. A pressed-on camshaft eliminates the necessity of engine timing and results in easier, more economical service replacement of the camshaft gear. The NVH-12 and V-12 use a flange mounted gear which must be adjusted when the engine is being timed.

In the new V-12 models Cummins has increased horsepower through larger displacement while maintaining weight, size, cylinder pressures and exhaust temperatures at the same levels as previous engines. At the same time internal improvements and accessory modernization will tend to reduce maintenance expense.

New insert type injector is designed for use with internal fuel lines. Injector is inserted into cylinder head, then pulled down in place with capscrews.



the increased diameter comes another step towards higher horsepower: increased air flow. Air flow has been boosted from 820 to 930 cfm for the V12-525; from 1400 to 1500 cfm in the VT12-700.

Greater bore diameter and increased valve area account for the bulk of the horsepower increase but there are other new features to these two new engines.

Dual improved model T-590 turbochargers mounted in the Vee of the 700 hp Turbodiesel pack more air into the cylinders and allow sea level performance to altitudes as high as 4000 ft. Each turbo unit feeds one bank of cylinders.

The new V12 engines utilize an improved, simplified design of the Cummins PT fuel system. In previous pumps torque control was achieved through a separate pressure regulator. Now the governor shaft controls the torque through the entire operating range. A pressure compensator has been added at the gear pump to eliminate pressure surges that might affect evenness of engine

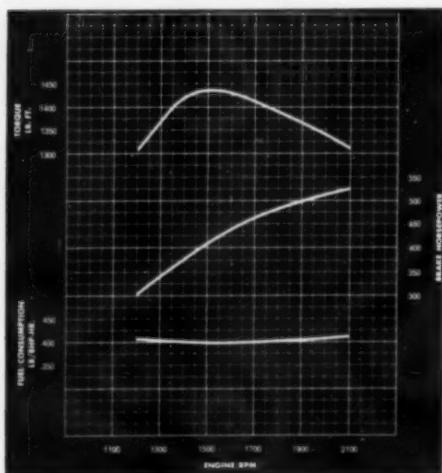
power. The PT pump controls pressure of fuel delivered to the injectors and this pressure control and a fixed size opening in the injector determine the amount of fuel delivered to the cylinder and thus, the engine's power. Fuel pressure is controlled by means of an engine type throttle. The PT pump is flanged mounted on both engine models, eliminating the chain drive coupling used on previous engines.

The new V12 engines utilize the internal fuel line system introduced on Cummins engines with the V8-350 and VT-430 models. The V12-525 and VT12-700 deliver fuel to the injectors through passages drilled in the cylinder heads. Another drilled gallery returns excess fuel from the injectors. Previous design utilized external fuel manifold, return manifold and tube connectors from the manifolds through the head walls and into the injectors. The new internal system is expected to require less maintenance labor through elimination of threaded connections, improved dependability through reduced possibility of damage to fuel lines and lower service costs because absence of threaded connectors which reduce chances for dirt to enter and damage injectors. New injectors are inserted into the cylinder heads and then pulled down into place with capscrews. "O" rings seal the fuel pressure and return passages.

New cylinder heads designed for the engines include, as well as the internal fuel lines, bigger exhaust and intake passages, larger valves and improved mounting. Use of 18 hold down capscrews, compared with 12 on previous designs, improves the design by applying even pressure on the liners to minimize possibility of movement and chafing between liner and block; reduces stress on counterbore block ledge through less concentrated loads and improves gasket life and reduces possible head and valve seat distortion due to high concentration of stress.

Other features on the new engine include cylinder liners that are 20 per cent thicker than

Power curve, V12-525 engine.



ENGINE BRAKE OFFERS SAVINGS AND SAFETY

By ROBERT E. SCHULZ

WEST Hartford, Conn.—In recent months, a good deal of attention has been directed to new methods of vehicle retarding, and here at the Clessie L. Cummins Division of Jacobs Mfg. Co., a new engine brake is being produced that is unique in its concept and efficient in its operation. This article with its illustrations establishes the former point and your editor's test ride in a Jacobs brake equipped diesel OTR tractor coupled with field reports demonstrated the latter.

Simplicity best describes the design, installation and operation of this new engine brake developed by Clessie L. Cummins, a name synonymous with the diesel trucking industry. Well aware of the problems faced by drivers on grades, Mr. Cummins told me of his own experience, and in particular one occasion when he was driving a test tractor with fading brakes down the old Cajon Pass in southern California. "Luckily I survived," he exclaimed, "but right then and there I was convinced that my diesel engine was not much help in holding back a truck." This started an idea that Mr. Cummins was later to develop following his retirement from Cummins Engine Co. At that time he formed his own development organization in California—this brake project his paramount objective. Coincident with the completion of a prototype unit, Jacobs Mfg. Co. was contracted to build the first set of engine brakes for test purposes. The successful completion of these tests with truckers in the western part of the country resulted in the formation of the Clessie

L. Cummins Division at Jacobs and full scale tooling and production of the brake.

Meeting also with W. Page Wodell, sales manager for the new division, we went over the design of the brake and its operation. According to Wodell, the device basically converts the engine into an air pump which makes use of the braking motion inherent in the engine but which, up to now, has not been effectively harnessed. Braking a vehicle requires that the energy of motion be transformed to heat energy. A vehicle's service brakes transform the energy by means of friction on the brake lining. Some vehicle retarders use a turbine in the drive line in which fluid driven by motion of the vehicle absorbs the power of motion to transform it into heat. The heat is then dissipated through heat exchangers in the cooling system.

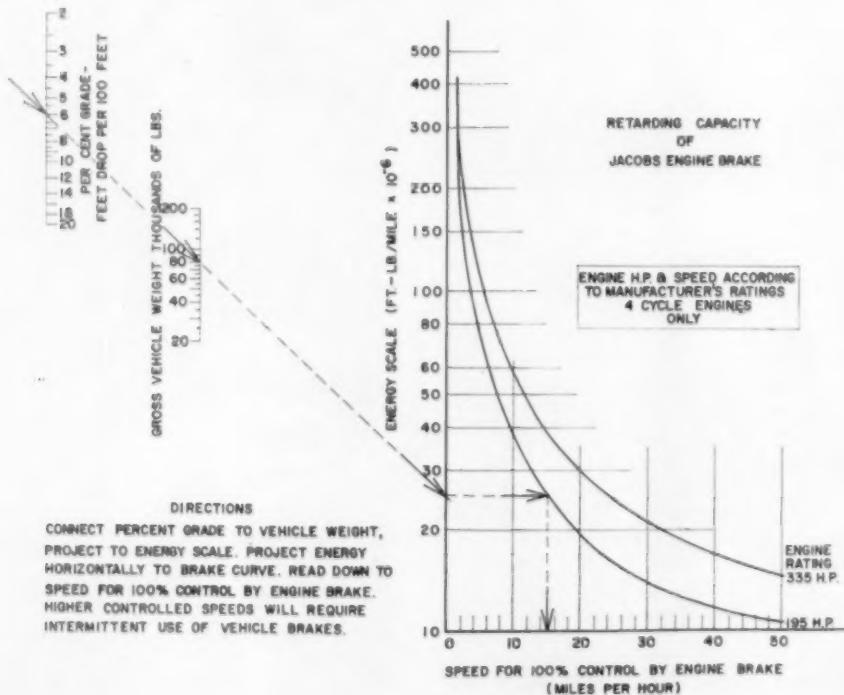
As is shown in the illustrations, the Jacobs brake is installed between the top of the engine rocker housing and the rocker cover with one unit for each pair of cylinders. Present production models are specifically designed for use on Cummins NH series diesels, both naturally aspirated and supercharged, and are applicable for on and off-highway service. "As soon as initial production is established in this area," Wodell stated, "design and development of brake models for other engine models and makes will proceed."

Now, referring to the operating diagram—the engine is allowed to compress air in the cylinder on



the compression stroke as it does in normal operation. But just before the piston reaches top dead center fuel injection cycle is interrupted and the exhaust valves are opened releasing the compressed cylinder charge to exhaust. The heat from compression is dissipated through the engine cooling system in the conventional manner. Thus the energy of the vehicle's own forward motion is put to work to retard it. And the heat energy which normally would go into the service brakes goes to

Here is a chart produced by Jacobs that enables operators to check the control factor of their vehicles on any grade.



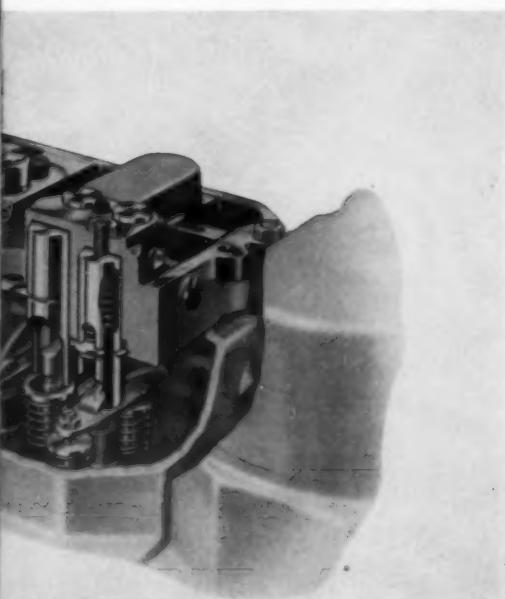
DIESEL AND GAS ENGINE PROGRESS



the radiator keeping the engine hot on downgrades. As Mr. Cummins states, "the brake converts the diesel into a 100 per cent workhorse that pulls its load uphill and holds it back going downhill. You might say that we have finally caught up with the mule who has known how to do this for a long time."

Installation of the brake is a relatively simple operation requiring an estimated four hours time.

Cutaway section of the Jacobs Brake showing master slave piston and three-way solenoid valve.



Here is the Cummins NH-220 diesel with engine brake as installed in the company's test tractor. Brake units are located between rocker housing and rocker cover. Total additional weight is about 70 lbs.

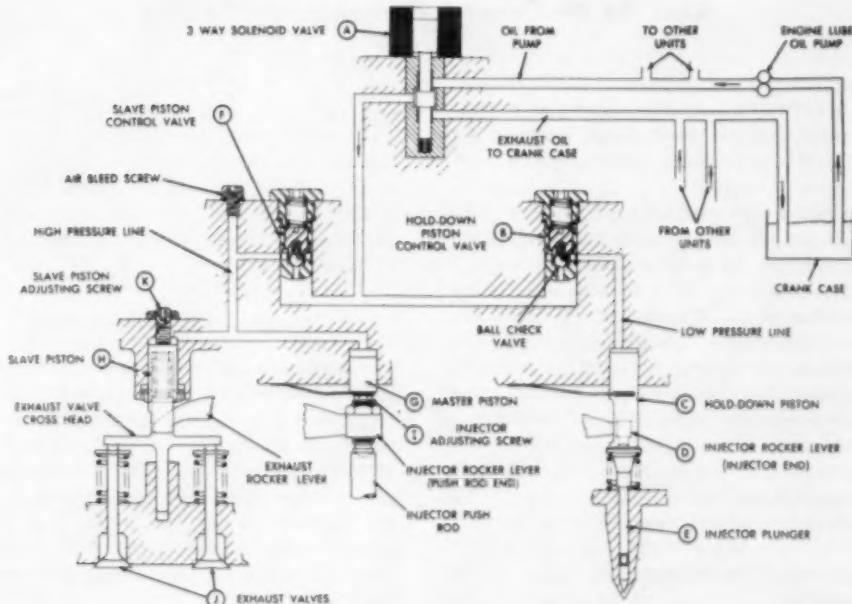
A complete set of three units (one for each two cylinders) adds about 70 lbs. to the vehicle, and as can be seen in the installation view, slightly more than 1½ in. to the height of the engine.

Brake controls are simple and are located in the cab. A toggle "on-off" switch is mounted on the dash, as was the case with the test vehicle I rode, or at any other location convenient to the driver. Then individual spring loaded, plunger type cut-out switches are mounted behind the accelerator and clutch pedals. At the start of a trip, the operator throws the dash control switch to the "on" position. From here on in, whenever he takes his foot off the accelerator (without depressing the clutch) the pedal switch energizes the circuit and the cylinder units go into operation. The circuit cuts out as soon as the accelerator is depressed, cuts in again when it is released . . . and this cycle continues until the completion of the trip. The clutch switch working in combination with the accelerator switch enables the driver to come up to a stop light or to a standstill, plus of course, allowing the normal shifting process to be accomplished without the engine brake coming on.

It is apparent that the Jacobs brake has a number of mechanical advantages, safety to the vehicle and driver being the most obvious. Over and above the downgrade retardation, the brake provides anti-skid characteristics on wet or icy pavements, since wheels do not lock and the retardation is uniformly applied to all driving wheels in proportion to the speed of the diesel engine. A good number of test installations have shown an appreciable reduction of service brake lining and drum wear. In fact, records show life extended two to five times on vehicles with the engine brake. Truckers with a lot of downgrade operation also report important fuel savings (the injectors are locked out when the brake is engaged). Other advantages pointed out by Sales Manager Wodell were: better engine operation by maintaining operating temperatures on down grades; reduction of flat spots on tires with consequent reduction in balancing time; and prevention of excessive smoking after long descents. With the brake system it is also possible to isolate faulty fuel injector operation by electrically disconnecting cylinder pairs with the brake engaged.

The Clessie L. Cummins Division will sell the Jacobs brake through a network of established distributor outlets in the diesel field which will install and service units as well as carry a complete stock of repair parts.

General operating schematic and description of the new brake system.



THEORY OF OPERATION—Simply stated, energizing the Engine Brake effectively converts a power producing diesel engine into a power absorbing air compressor. It is accomplished as described through simultaneous:

a. Interruption of the normal fuel injection cycle by stopping cylinder fuel delivery, and

b. Motion transfer through a master-slave piston arrangement which opens cylinder exhaust valves near compression top dead center releasing the compressed cylinder charge to exhaust.

The blowdown of compressed air to atmospheric pressure prevents the return of energy to the engine piston on the expansion stroke, the effect being a net energy loss since the work done in compressing the cylinder charge is not returned during the expansion process.

B. INJECTOR CYCLE INTERRUPTION—Referring to the schematic drawing, interruption of the fuel injection cycle is performed as follows:

1. Energizing solenoid valve 'A' permits engine lubricating oil to flow under pressure through control valve 'B' over both master piston 'G' and slave piston 'H'.

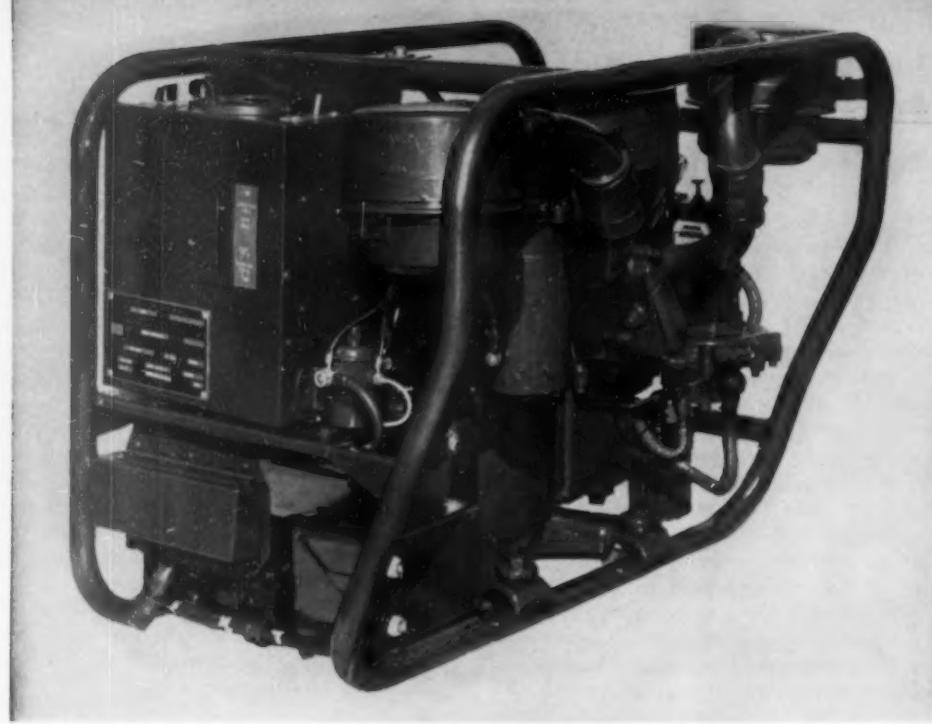
2. Oil pressure causes master piston 'G' to move down, coming to rest on injector rocker arm adjusting screw 'T' which is at its lowest position.

3. Injector rocker arm adjusting screw 'T' begins upward travel (as in normal injection cycle) forcing master piston 'G' upward and creating a high pressure oil flow to slave piston 'H'. The ball check valve, control valve 'F', imprisons high pressure oil in the master-slave piston system.

4. Slave piston 'H' under the influence of the high pressure oil flow moves down momentarily opening exhaust valve 'J' while engine piston is near its top dead center position releasing compressed cylinder air to the exhaust manifold.

5. Compressed air escapes to atmosphere completing a compression braking cycle.

The above process of converting the diesel engine to an air pump requires that the engine produce work under conditions which formerly it was not required to do. Since the diesel engine is turned over by the driving wheels of the descending vehicle through the vehicle drive line and transmission, application of the Jacobs Engine Brake retards the "free-wheeling" effect of the driving wheels and a braking action results.



Portable diesel generator set with new American Marc opposed piston diesel mounted above the generator. Note compactness of package and Curtiss Wright hydraulic governor.

In the new engine the cylinder block consists of an aluminum casting enclosing the crankcase on both ends. The development program includes engines of 9, 19 and 21 cu. in. displacement. So far all the units have the cylinder axis horizontal and the crankshafts vertically arranged. But, because of their construction, especially regarding the lubrication system which is outlined below, the engines are not sensitive to various running positions or attitudes.

3500 Cycles/Minute

High silicon-aluminum pistons were chosen for the opposed piston engines to give long life with minimum maintenance and overhaul. The aluminum also gives good heat conductivity, an important factor with 3500 combustion cycles per minute. Both pistons are symetrically alike and both have three rings above and two rings below the wrist pin.

Connecting rods are steel forged and provided with needle bearing at the wrist pins and a caged roller bearing at the big end. Case hardened bores are used in the connecting rod where the rollers run directly without an outer race. The crankpin also is hardened and ground and acts as the inner race of the connecting rod bearing.

Both crankshafts are carried in taper roller bearings. For those engines with an extra scavenging piston one crankshaft carries a set of eccentrics besides the counterweights. The scavenge piston is activated by two parallel aluminum connecting rods which run with sleeve bearings on the eccentrics. The counterweights are extremely small because they balance only the rotating weight of the connecting rods. The oscillating masses of the pistons, wrist pins, and upper connecting rods are balanced against each other. This gives very good smooth running conditions.

AMERICAN MARC'S SMALL OPPOSED PISTON DIESEL

Compact, Lightweight Units Being Built for Generator Set Applications to 2.5 KW And As Outboard Propulsion Engine

FOLLOWING its line of small engine development, American Marc has now developed and introduced a new opposed piston, two cycle diesel in the low horsepower field. The new engine is being built for generator set applications to 2.5 kw and as an outboard propulsion engine rated 9½ hp at 3500 rpm. Its designed compactness makes it ideally suited for many government services and its mobility—a 2.5 kw set weighs 120 lbs.—should make it attractive to contractors, aggregate producers, etc., for lighting purposes. It also can be used extensively throughout industry for emergency power needs. Available either air cooled or liquid cooled, this pioneering development represents the first in a family of small diesels in three displacement sizes and ranging from 3 to 9½ hp, now in development by American Marc.

Fuel economy, dependability and long life are features that have made the high speed diesel

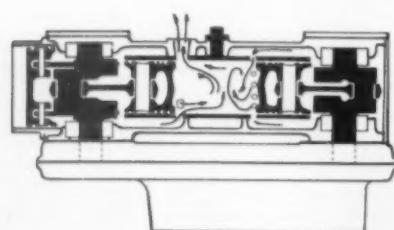
popular in larger sizes for industrial engine users. These same features can mean similar benefits for users of small size engines with the small diesel designed compactly for the application, and priced to allow diesel economies to pay out. This American Marc development seeks to accomplish these aims and objectives.

Introduced At SAE Meeting

The new engine was introduced by Adolf Luerken, the company's technical director and Kris Somogyi asst. chief engineer, at the SAE National Powerplant Meeting in Cleveland, Oct. 31-Nov. 2, 1960. The paper presented there covered the important development and design considerations of the engine. With light weight being a primary objective American Marc has achieved a complete diesel generating set, light enough to be carried easily by two men.

Cutaway view of the cylinder showing the operation of the Vendaco scavenging system in which air compressed in the crankcase flows through cylinder ports to provide scavenging and combustion air.

High speed automatic multi-spindle drilling operation of cylinder block on this machine illustrates the type of specialized machinery installed at the American Marc plant for the efficient production of these new small diesels.



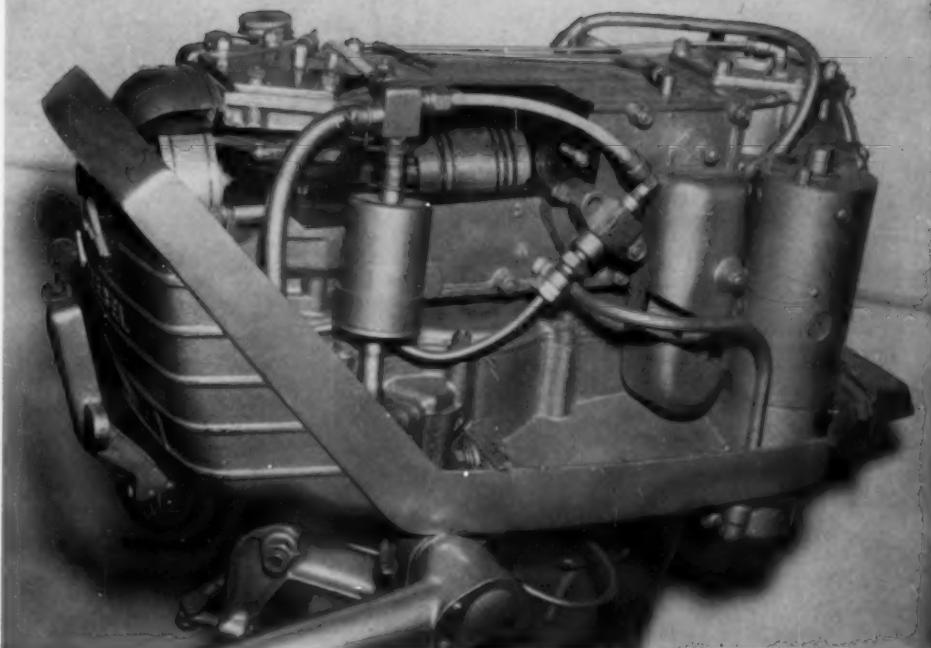
DIESEL AND GAS ENGINE PROGRESS



To synchronize the two crankshafts and to carry the power of both to a common flywheel and power takeoff a straight spur gear train is used. The two outer gears are mounted on the crankshafts. The flywheel and cam gear are mounted in the gear case cover but are supported by needle bearings on the other side. All out-going shafts are sealed so that oil filling in the gear case stays for long periods of operation. All accessories are driven from the gear train.

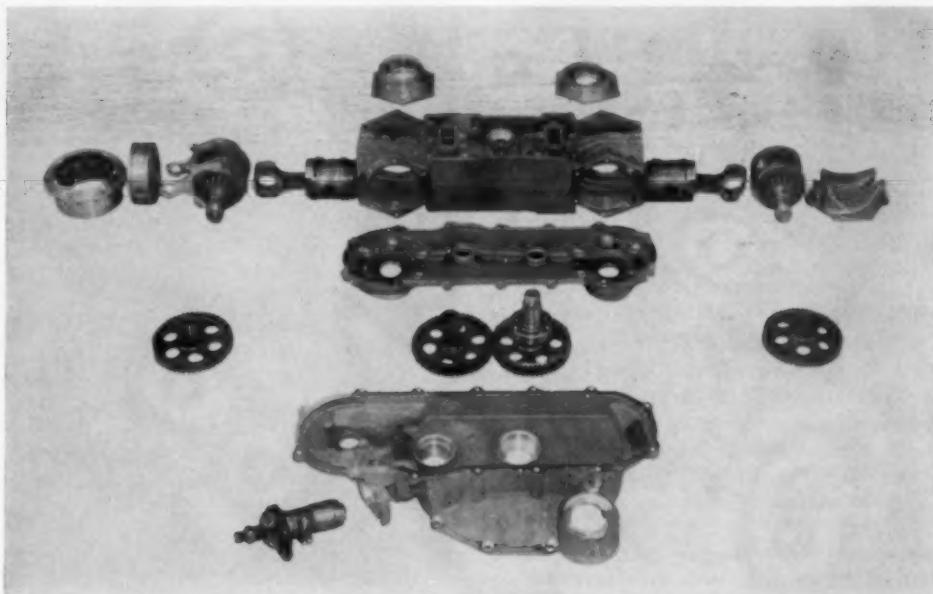
Unique Lubrication System

Unlike small gasoline engines which get their lubrication by a mixture of oil in the fuel these small two cycle diesels have a lube oil metering pump which delivers precisely measured droplets of oil where and when needed. The oil droplets run through the main bearings and to the connecting rods, to the cylinder and to the pistons. From the cylinder wall the oil finally burns slowly and leaves this system through the exhaust ports. There is no oil change, no recirculation, and no filter replacement.



Closeup of the American Marc outboard diesel unit with cover off and cylinder partially cut away. Note fuel injector and piston design in this compact opposed piston, two cycle diesel.

Exploded view of engine components in water cooled version. Note the simplicity of the engine design to provide for light weight and compactness. Cylinder block is aluminum.



air charge as a loop is reflected back from the opposite piston, the ports on the charging end are uncovered. This delayed rotating airflow pushes the loop toward the exhaust ports and creates a rotating air turbulence in the cylinder.

The aircooled engines have finned cylinders, an axial fan and a shroud to guide cooling air. The water cooled version has a jacket around the cylinder and a double exhaust manifold. A rubber impeller pump drives the water through the cooling system. The units are equipped with electric starters. The lube oil pump and fuel transfer pump are driven at one crankshaft. As the engines have an extended gear train it is possible to connect additional accessories such as tachometer drive, battery charger or hydraulic equipment.

When used as prime power for a generator set, the new small engine rides atop the generator. The cylinder axis is horizontal, all shafts are vertical and the flywheel is replaced by the rotor of the generator, which is geared up to 6000 rpm. Since the o-p engine is almost perfectly balanced the generator housing can be used as the main support. In the outboard version the flywheel is beneath the engine and a wide flange connects the engine to the leg. The drive shaft is held with a spline in the flywheel nut while the lower end of the shaft runs directly in two needle bearings and carries the small pinion of the propeller gear. The water pump on this version is lined with stainless steel for trouble free operation in salt water.



In the new units, a mechanically operated unit injector is used on the air cooled generator sets and separate injection pump and injector on the water cooled commercial engine. The injection pump in the water cooled version is directly actuated from a cam on the gear train; the unit injector on the air cooled engine is actuated by a push rod arrangement, also off the gear train. Amarc's development work showed the direct injection, open chamber type of combustion system to be superior for these small engines and the chamber is thus formed by two cavities in the piston, and injection is directly into this chamber.

Cylinder scavenging is by the Vendaco system in which air compressed in the crankcase flows through the cylinder ports to provide scavenging air and combustion air. In the Vendaco system "loop ports" become uncovered after the exhaust blow down and the fresh air stream from the crankcase sweeps out exhaust gases from the cylinder. When the stream starts diminishing and the



NEW CENTER FOR DIESEL SERVICING, REBUILDING

ADVANCES in diesel technology require similar advances in service procedures to assure engine users that they are getting the best fuel consumption, power output and life their engines can deliver. Service facilities to help deliver this assurance are being constructed throughout the country as operators of these establishments find that increasing numbers of diesels in use, and resultant service needs, require new plant layouts to accommodate the men and machines necessary to the operation.

Although larger than most, the facilities of the

Cummins Sales & Service Co., just completed near Arlington, Tex., typify the up-to-date trend in diesel servicing that is becoming the standard of the industry.

The new center is located on a 10 acre tract in the Great Southwest Industrial District, midway between Dallas and Ft. Worth. The new building itself covers approx. 58,000 sq. ft. and is divided into four major working areas: general and executive offices, engine rebuild plant, central parts warehouse and truck service stop.

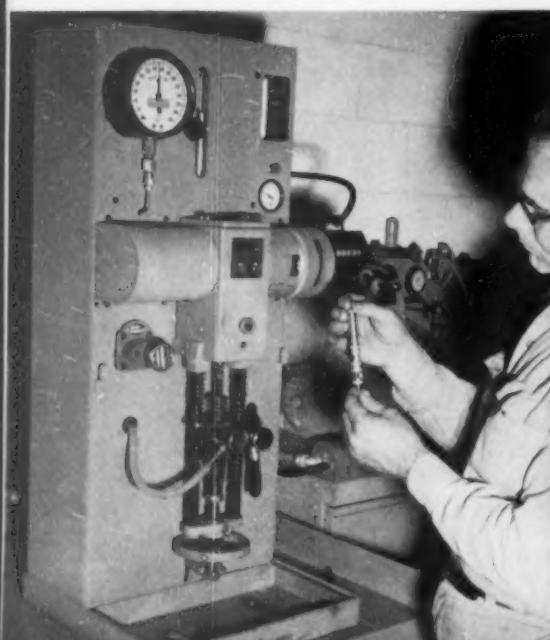
The engine rebuild plant covers approx. 16,000 sq. ft. of the building. Here engines slated for rebuild are first steam cleaned and checked thoroughly, including Sonoflux inspection, to locate any



defects in machined surfaces. Then, as it passes through the shop, the engine is checked and completely rebuilt to meet specifications.

From the rebuild shop the rebuilt unit goes to one of eight test cells for a complete operating check. The cells, each equipped with Clayton dynamometers, are uniquely laid out with the instrument panel for each cell angled from the wall so one mechanic can keep a close watch on two engines at once. In this final quality control check, the engine is pre-oiled before starting from underground lube oil pressure tanks. The pre-lube assures that all oil galleries and bearing surfaces are properly lubricated before operation. The engine is then performance checked under normal operating conditions until it is properly

First major step in engine rebuild is magnetic inspection. This is a fast and sensitive means of locating defect and determining if it is surface or sub-surface. Operator is using black light fluorescent lamp to check engine crankshaft.



New Cummins Sales & Service, Inc., diesel engine center is located in Great Southwest Industrial District at Arlington, midway between Dallas and Ft. Worth, Tex.

Warehouseman "picks" order from IBM card controlled parts bins. Each individual part is identified by an IBM card with quantity to be shipped on each order shown. Control system aids accuracy and speed and keeps running inventory instantly available for parts control.



run in and specified horsepower output at a specified rate of fuel consumption is established.

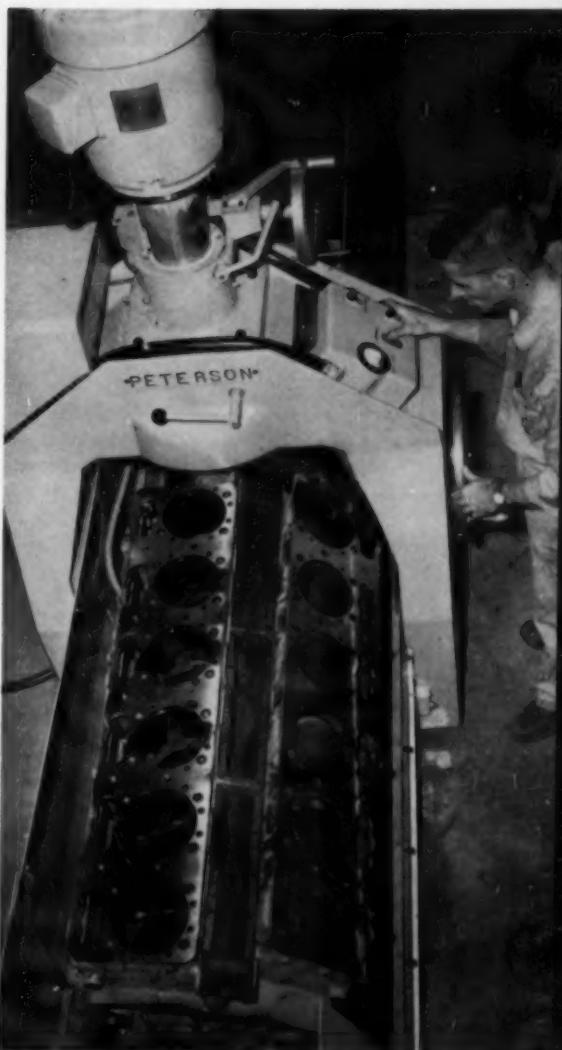
A battery of exhaust silencers mounted directly behind the dynamometer test cell area muffles the exhaust noise from the cells. Cooling water for engines under test is circulated through a double flow cooling tower. Water is piped in hot from the test cell and distributed over the fill by the open base method of distribution. Air is pulled across the fill by two 120 in., nine-bladed fans. The tower can cool 625 gpm of water from 160° to 85° F under normal operating conditions and has cooling capacity equal to 750 tons of air conditioning.

A parts and engine inventory in excess of \$1 million is stocked in the warehouse section which is the central distribution center for Cummins Sales & Service's five state operations. New and rebuilt engines are stocked for availability to CS&S shops as well as OEM dealers throughout the system. The firm's 15 factory-type shops will continue to stock parts and service engines as in the past but the new center will enable any of the outlets to get overnight delivery on parts.

The service shop covers approx. 10,000 sq. ft. and includes seven drive-through stalls, capable of handling 23 trucks at one time, accessible through 14 truck bays. Two chassis dynamometers are included in the modern machinery and tools used in servicing trucks. The facilities enable CS&S mechanics to replace entire engines or their component parts and do frame overhaul as well as general overhaul work.

Cummins Sales & Service is distributor of Cummins engines in Texas, Louisiana, Mississippi, Oklahoma and Kansas. Ken W. Davis is chairman of the board; president is L. J. Stroutz. H. B. Burr is vice president of sales and E. W. Wright is director of operations.

Eight Clayton-equipped dynamometer engine test cells are in operation in new shop. Instrument panels are in air-conditioned runway between cells. Note Alnor pyrometer.



Surface grinder is used to mate head-to-gasket sealing area to Cummins VT-12 block. Lower, Mechanic fits bushings in a connecting rod. Bushings are cut to approved specifications on Tobin-Arp pin fitting machine to assure proper fit on pin.



HIGH SPEED ALUMINUM V-4 BY P&H

LIght weight, design simplicity and fuel economy are some of the important features of a new, high speed, Vee type diesel engine now in production by the P&H Diesel Division of the Harnischfeger Corp.

Designated the model V-463, the engine is a high speed, loop scavenged, two cycle type diesel, built in a 90 degree Vee. The four cylinder engine has a 4 in. bore and 5 in. stroke for a total displacement of 252 cu. in. Actual compression ratio is 16:1. The engine is rated 135 max. hp, 115 intermittent hp and 100 cont. hp, all at 2800 rpm. Dry weight of the basic engine is 780 lbs.

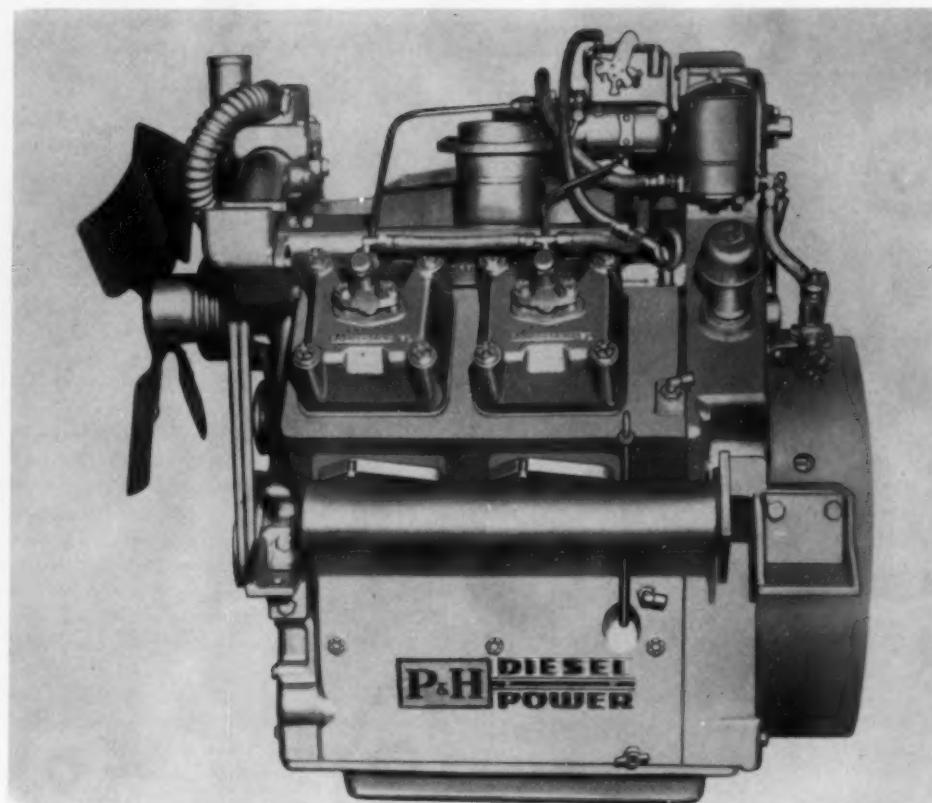
Extreme light weight features were obtained through use of aluminum alloy material in all major components such as crankcase, flywheel housing, blower and cylinder heads. This combination of components provides low weight per horsepower and at the same time provides reliability and long service life.

The engine was developed for high speed applications in the 2000 to 2800 rpm range such as the automotive, marine and industrial fields. The loop scavenging eliminates all valves and their operation mechanisms, with exhaust gases removed and intake air received through porting in the wet type cylinder liners.

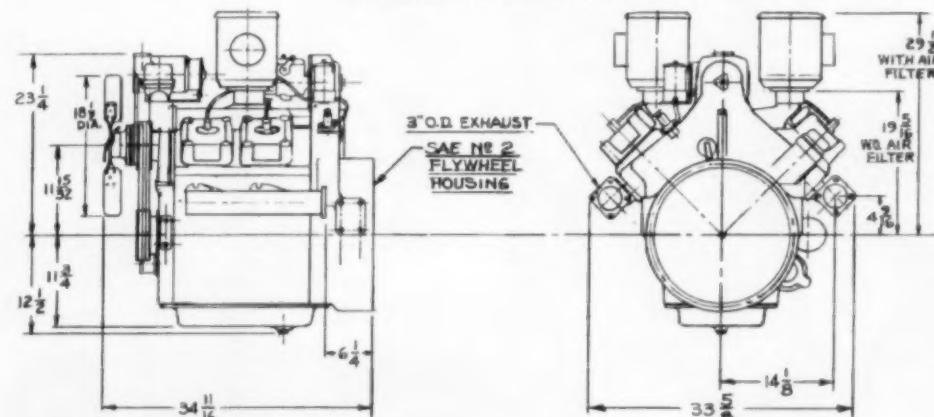
With diesel applications in the light truck market promising to play a larger and larger part in the field, this P&H diesel is pointed directly to requirements calling for light weight, high torque, quick response and good fuel economy.

Dimensional drawing of V-463 engine.

This 24 ft. runabout is powered by P&H model V-463 engine turning 13 x 15 in. propeller through a 1:1 Vee drive at 2800 rpm.



New P&H model V-463 diesel engine has maximum rating of 135 hp at 2800 rpm; basic engine has dry weight of 780 lbs. Aluminum components help achieve favorable weight-horsepower ratio for automotive, marine and industrial applications calling for high speed-high torque characteristics.



In the marine field the engine provides quick response characteristics plus the economy of diesel engine use. P&H aimed towards marine applications such as runabouts 20 to 32 ft. long and light, twin engined cruisers to 40 ft., in working out design of the model V-463. High speed and light weight features make it possible to apply the engine to inboard-outboard drives as well as conventional type drives.

The engine was also designed for applications in the industrial field calling for high speed-high torque characteristics. These would include feed mills, pumping units, motor graders, lift trucks, loaders, and similar equipment.

A more complete story on the engineering and production of this new P&H engine is now being prepared and will appear in an upcoming issue.

9-SPEED HEAVY-DUTY TRANSMISSION

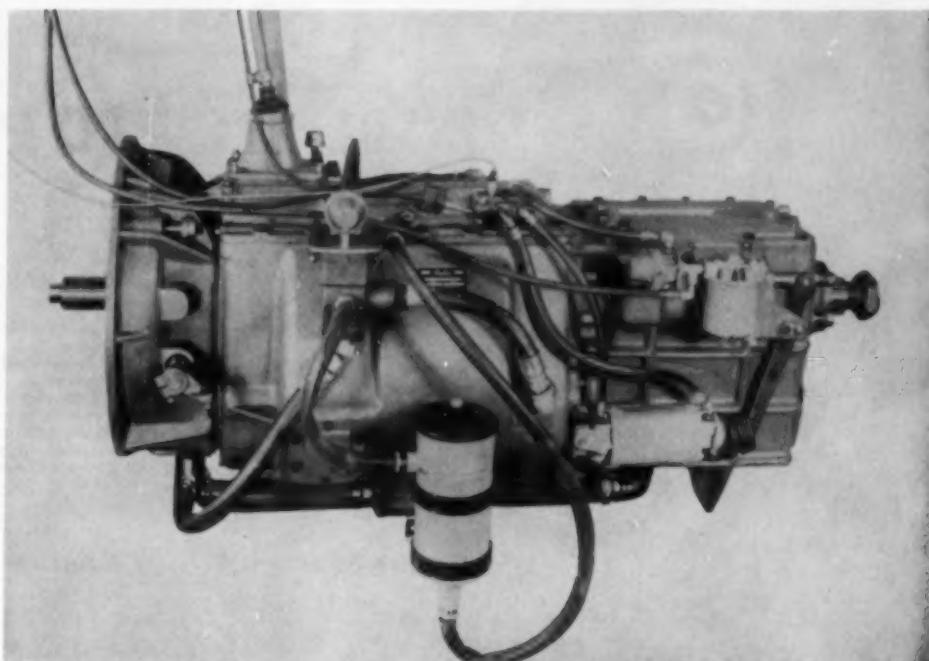
A NEW, nine-speed transmission for extremely heavy-duty off-highway and industrial applications has been announced by Fuller Manufacturing Co.

Providing nine closely-spaced forward gear ratios (9.24:1 to .69:1) selected with a single shift lever, the Fuller R-1750 RoadRanger transmission features pressurized jet spray lubrication system for the operating gear teeth, pressurized lubrication for the mainshaft pilot bearing of the front section as well as bushings of the mainshaft mounted gears, a countershaft inertia brake which makes quick upshifts possible without double clutching, and an inhibitor which prevents the operator from engaging gears in the front section until the automatic shift in the auxiliary is completed.

The newest RoadRanger is engineered for service with the most powerful automotive diesel engines built in such applications as earthmoving, mining and quarrying. Progressive steps-average 38 per cent between forward ratios. The R-1750 RoadRanger also provides two reverse speeds.

Jet spray lubrication system of the R-1750 RoadRanger works from a pump mounted on the front of the countershaft. The pump draws gear oil from the cases of both the main and auxiliary sections and forces it through a cartridge-type oil filter. Filtered oil is then channeled under pressure through passages in the drive gear and mainshaft and through overhead jets located in the shifting bar housing and rear case cover.

An oil sump, located on the bottom of the front section case of the R-1750 RoadRanger, is connected to the rear section by means of a hose. The sump contains a strainer assembly and a magnet which collects and holds foreign material.



The semi-automatic Fuller 9-speed R-1750 RoadRanger transmission.

Gear oil and collected foreign matter is drained from the front section by removal of the sump housing; the oil strainer is also easily removed for cleaning. Gear oil in the rear section is drained by removal of a conventional pipe plug.

The hydraulic countershaft brake eliminates double clutching on upshifts and is activated by pressing a button before each upshift is made.

Two power take-off openings are provided on the R-1750, one on each side of the transmission. On the right side, a heavy-duty type provides drive

gear speeds of .74 engine speed, while a regular-duty type on the left side provides drive gear speeds of .60 engine speed.

Gear ratios for the R-1750 are as follows:

9th	.69	4th	3.53
8th	1.00	3rd	4.94
7th	1.40 HIGH	2nd	6.91 LOW
RANGE			RANGE
6th	1.96	1st	9.24
5th	2.62		
Reverse, High Range: 2.71 Reverse, Low Range: 9.56			

NEW SPARK ARRESTOR FOR MOBILE, STATIONARY UNITS

A NEW, vane type spark arrestor, adaptable to mobile and stationary diesel engines, has been introduced by the Air-Maze Corp. Designed for rugged reliability and long service life, the spark arrestor has passed a variety of tests including the U. S. Department of Agriculture, Forestry Service, test specification.

The arrestor employs a centrifugal action principle without the use of moving parts. As the exhaust stream flows through the unit, the stationary vane imparts a spinning action to the air flow. This rotary motion drives the heavy particles of hot carbon to the outside of the stream and into the spark trap. The straight flow action of the arrestor places minimum back pressure on the engine. The trap can be cleaned by opening the cleaning port with the engine operating at idle speed.

Although not intended for use as a muffler, the unit sound attenuation characteristics compare favorably with a "straight through" type truck muffler. Any ordinary muffler can be installed with the arrestor without loss of operating efficiency.

Standard models are available in aluminized steel with cast, ductile iron vane. They are made in four sizes to fit engines from 150 to 1200 cu. in. displacement. The manufacturer will provide bushings for installation on non-standard inlet pipes.

Cutaway view of new vane-type spark arrestor introduced by Air-Maze. Stationary vanes impart spinning action to exhaust air flow. Particles of hot carbon are carried to outside of stream into spark trap.





DIESEL SERVICE PROGRESS

A COMMENTARY BY GEORGE R. MACKEY

George R. Mackey was long associated with Detroit Diesel Engine Division of General Motors Corp., and had prior experience as a mechanic in Europe and the U.S.A., which enabled him to become well acquainted in the diesel and service fields and to obtain a broad scope of the service industry from the customer's and management's viewpoint. Further training at Carnegie Tech and in the Army Ordnance during World War II provided the necessary requirements in planning service programs. Progressive advancement in diesel service areas in General Motors and with Detroit Diesel led to his position as Supervisor of Service Promotion. Upon termination of employment with General Motors in 1952, he joined Clayton Manufacturing Company, and his present position with this organization is Sales Manager of the Dynamometer Division.

The Modern Diesel Engine

THOSE who work in the diesel engine industry, especially those in the sales and service fields, are often called upon to explain the operating principles of the modern diesel engine. The discussion might be directed to one who is fairly well versed, or to a layman who only understands that the diesel requires a different type of fuel to that used in an automobile. The alert salesman or serviceman, when called upon, should know all of the features of his engines, and all of the improvements made in recent years which have led to its acceptance in all the fields for which it was designed. He should be able to paint a verbal picture portraying exactly what goes on inside the cylinder, pointing out improved valve mechanisms, higher compression pressures, improved fuel injection, smoother flowing air systems, improved control of turbulence in the combustion chamber, and the many other improvements. It should be pointed out that all of these improvements result in greater horsepower per engine unit size as well as longer life expectancy. Possibly one of the most interesting subjects from a customer's point of view, which is often overlooked, is that metallurgical and mechanical improvements work hand-in-hand with improved service techniques to insure longer engine life, increased horsepower, and greater operating economy. Most everyone realizes that today's engines are more efficient and better engineered, but they often overlook the fact that engines are more complex and all repairs and adjustments have become more exacting. The more precision teamwork from all of the engine systems today demands rigid maintenance schedules, more exacting diagnosis, and precision repairs.

The encouraging part about explaining the principles of the modern engine is that they are the same as those in the earliest diesel engines. Once these principles and the engine's operating characteristics are fully understood, there is nothing that can go wrong with the most complicated engine that cannot be reasoned out. But, to be able to reason or think things out, the understand-

ing must be genuine and complete. This provides a wonderful opportunity to explain to a customer the logic of dealing with an organization well staffed with trained, capable technicians, and equipped with the most modern facilities.

One method which can be used to advantage when explaining any engine is to divide the engine into three basic divisions: 1. Air, 2. Fuel, 3. Compression-Ignition. It will be assumed that an understanding exists whereby the crankshaft, connecting rods, pistons, valves, etc., provide the foundation upon which these divisions can best be made to work as a team. As basic engine divisions, Air—includes all the mechanism required to deliver a sufficient quantity of clean, fresh air to each cylinder under all operating conditions; Fuel—includes all of the mechanism required to take fuel from the tank and deliver it into each cylinder in the proper quantity at the right time to assure complete combustion under all operating conditions; Compression-Ignition—when used to designate a basic division of a diesel engine, is a broad term covering the application of diesel ignition in either four or two cycle principles.

Let's consider other things necessary to cover when explaining the diesel cycle of operation. Diesel engines are internal combustion engines designed to convert chemical energy into mechanical energy. In order to convert chemical energy to heat, it is necessary to burn or cause combustion of the chemical, which, in the case of diesel fuel, requires the presence of oxygen. Too little oxygen can cause incomplete combustion, thereby wasting a considerable portion of the potential energy in the fuel. It is the function of the engine to convert the chemical energy of fuel into mechanical energy. The more chemical energy put into the engine, the greater will be its power output, provided sufficient oxygen is always available to effect proper combustion. The more efficiently chemical energy can be converted, the more power the engine will develop, and the more economical it will be to operate. For the engine to be capable

of converting the maximum percentage of fuel energy to mechanical energy, it is necessary to: 1. Charge each cylinder with a sufficient quantity of air; 2. Compress the air in the cylinder to a satisfactory pressure and temperature to ignite and completely burn the fuel injected into the combustion chamber; 3. Inject the exact amount of fuel into each cylinder at exactly the right time; 4. Arrange, by proper care, for the mechanical portion of the engine to get the greatest possible mechanical force from the pressures generated by combustion. It must be realized that certain limitations, chemical, metallurgical and mechanical, are inherent in any engine. Thus, the most modern engine is somewhat of a compromise, and converts only a portion of the potential fuel energy into mechanical power. Even though diesel fuels may vary slightly in potential energy content (BTU's), the major improvements in power from an engine of a given size can only result from converting more potential heat energy to work. It is important to keep in mind that the principle function of the diesel engine, both four and two cycle, is to convert chemical energy into heat, and heat into mechanical power—thus we can consider the diesel as a heat engine.

It is easy to see that to get a heat engine (diesel) to operate, we must put the source of heat (air and fuel) into the engine—create combustion—turn the heat into mechanical power—and get the burned gases out to make room for a new charge. This, obviously, must be done over and over again as the engine runs, so all we have to do is to follow one of these series of events until it is followed by another similar one. This one series of events is commonly known as an operating cycle. Today, we have engines that operate on either the four cycle or two stroke cycle principle. As the terms imply, the four cycle engine requires four strokes of the piston, two up and two down, for each cycle of operation. The two cycle requires only two piston strokes, one up and one down, for each engine cycle.

For the purpose of clarification, all types of engines, diesel, oil or gasoline, can be placed in one of two categories. They either belong in the compression ignition group or the auxiliary ignition group. This is sometimes confusing to the layman. However, in the first group, "compression ignition engines" is where the diesel engine truly belongs because it utilizes the heat of highly compressed air to ignite the fuel charge. The second group, "auxiliary ignition engines," covers all types of gasoline, kerosene and oil burning engines, and cannot be termed as compression ignition, as these types of engines require an auxiliary system to create ignition.

Scallopier *Midnight Sun*



The *Midnight Sun* is a 72 ft. scallopier operating out of Fairhaven, Mass., and owned and operated by Capt. Magne Risdal. The vessel was built by Harvey F. Gamadge, South Bristol, Me., and went into operation in May, 1960. The *Midnight Sun* is powered by a GM 12V-71 diesel engine rated 335 hp at 1800 rpm. The engine is fitted with Twin Disc model 512, 4.15:1 hydraulic reverse-reduction gear and 3:1 power takeoff for operating the winch. A five blade 52x38 in. Columbia propeller turns on a 4 in. bronze shaft with Goodrich Cutless rubber bearing and flax packed stuffing box. Auxiliary power is supplied by model SL2, 2 cylinder, 8½ hp, air cooled Lister diesel which drives a 32 volt generator and 1½ in. Viking pump. The vessel has a beam of 17 ft., draft of 8 ft. 6 in.

Acquire Rochester Instrument Co.



C. L. Hastings

Acquisition of Rochester Manufacturing Company, Inc., Rochester, N. Y., by American Radiator & Standard Sanitary Corp., New York, has been announced. The Rochester company will now be operated as a part of the Detroit Controls Division of American-Standard which maintains

headquarters in Detroit, Mich. American-Standard acquired Rochester Manufacturing in exchange for about 125,000 shares of common stock. The company also supplies gauges and instruments as component parts for producers of farm and industrial engines and other original equipment manufacturers. C. L. Hastings, president of Rochester Manufacturing Co., will become a vice president of Detroit Controls. Warren W. Hastings will continue to manage production operations.



Atlas Missile as it clears the pad.

Engine exhaust heat, recovered by Vapor Phase® Waste Heat Recovery Silencers on White Diesels, is utilized in the latest design of ICBM sites. Cost of operation is reduced substantially by using this energy in various ways to supplement generated power. In other applications, engine heat from jacket water and exhaust is recovered for space heating, product heating and with absorption refrigeration for air conditioning. In addition to these advantages, Vapor Phase systems permit the use of cheaper fuel. Engine wear is reduced and you can lengthen the time between overhauls. Wherever engines are used, Vapor Phase® can improve efficiency and add economy.



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Vapor Phase Exhaust Waste Heat Recovery Silencer designed for use with the Superior Engine-Generators used by the Air Force at Missile sites.



Sole developers and manufacturers of Vapor Phase Thermal Circulation (Ebullition) Engine Cooling Systems.

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Inland River Reports

By A. D. Burroughs

CHRISTENING ceremonies for the new *Austin S. Cargill* credited the towboat as being the third most powerful Mississippi River towboat, second only to Federal Barge Lines' *America* and *United States*. Completed by St. Louis Ship-

building and Steel Corp., three Cooper Bessemer engines give the rated 6630 hp for owners Cargill Inc.

ONE of the longest towboats in action is the new 216x48 ft. *Mississippi*. Delivered by Ingalls to the Mississippi River Commission, the inspection vessel is equipped with Nordberg engines for a rated 3600 hp.

TWO GM engines will serve as the power source for the rated 3200 hp for the towboat under construction at Marine Welding and Repair Works, (Greenville). The 110x32 ft. un-named craft will be operated by owner RMR Towing Inc.

ANOTHER popular 3200 hp edition is the *Gilda McCool* with GM power for

service in the Greenville Transportation fleet. The 120x38 ft. towboat was delivered by Marine Welding & Repair.

THE *J. E. Vickers* boasts a rated 3000 hp supplied from two GM engines of 900 hp, another GM engine rated at 1200 hp. The new towboat operates for Delta Towing Co.

THE new *Jessie Norris* makes its claim to considerable power per foot, with 1000 hp provided by two Caterpillar engines. The 61 ft. craft was delivered by Gibbs Corp. for duty in the Jack Neilson fleet at New Orleans.

THE *John H. Elliott* was sighted in the coal trade making good time with power developed by the two Superior engines. The new towboat, 118x27 ft., was built by Hillman Barge and Construction Co., and operates with 1066 hp for U. S. Steel Corp.

TWO Caterpillar D375 engines provide the 650 hp for the new twin-screw towboat, *St. Marys*. The 63x21 ft. vessel, built by Barbour Metal Boat Works for McDonough Construction Co. (W. Va.), is now in service on the Ohio River.

UNDER construction at Main Iron Works, La., is the 70x32 ft. tug for Mutual Oil Co., Ala. Two Caterpillar engines will supply the rated 1000 hp for expected spring duty.

GERONIMO, the colorful name for the 61x19 ft. towboat joining the Cheramie Towing Co., La., has a rated 600 hp developed by two GM engines. The craft was completed by Universal Iron Works.

ON water was the *Enterprise*, another 1960 edition from Universal Iron Works, performing for owner LeBeouf Bros. Towing Co., La. The 57x18 ft. craft is equipped with two GM engines rated at a total 670 hp.

THE U. S. government has placed an order with Southern Shipbuilding Corp. Slidell, La., for two tugs, 101x29 ft. with a specified power of 2,000 hp each.

BAY Petroleum Co., Houston, has placed their order with Main Iron Works, Houma, La., for a 70x22 ft. tug, with an expected 1,000 hp.

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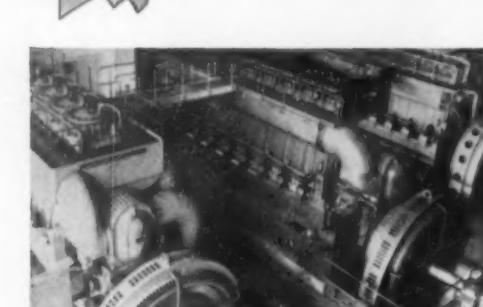
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COOK**
DIVISION OF **DOVER** CORPORATION.

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COOK RINGS IN DIESEL SERVICE 3 YEARS—STILL GOING STRONG

Here's a report on Cook rings at Rockville Centre, N. Y. municipal power plant. It's the result of a cylinder inspection on their No. 8 diesel unit after nearly three years of continuous operation.

"While several rings were replaced in Grooves 1 and 2, Cook rings in Grooves 3, 4, 5 and 6 could run for another 10,000 hours! And cylinders averaged less than .001" maximum wear per 1000 hours of operation."



Marine Costs Paper

One of the most important factors affecting the marine industry today—costs—was the subject of a technical paper read at a recent meeting of the New York Section of The Society Of Naval Architects and Marine Engineers. "Economic Criteria for the Comparison of Shipboard Power Plants" by John F. Nace, General Electric Company, outlined the more significant elements in the economic picture. First costs, operating costs and other economics for a modern shipboard power plant were reviewed.

Fast Drilling Rig

A rig operated by the Gustavson Drilling Company, Ltd., has established a reputation for fast drilling in the "bush country" of northern Alberta, Canada. Placed in service in January, 1959, the rig has drilled four 8,300-foot wells, two 7,300-ft. wells, two 5,200-ft. wells, and three 3,800-ft. wells, totaling 69,600 ft. and also has done considerable servicing and workover work. The locations are in the area of Snipe Lake, Normanville, Deer Mountain, and High Prairie. The rig is a National T-45, normally considered for the 4,500 to 7,500-foot depth range. Designed for compactness, the draw works compound and a General Motors Twin 6-110 engine, rated at 419 hp, can be carried as one truckload. A National C-250 Slush Pump, with an independent pump drive powered by a second General Motors Twin 6-110, with a steel winterized housing, forms a second truck load. Drilling is with 4½-inch drill pipe. A 127-ft. Lee C. Moore Mast is used. The portability of the rig proved very valuable in reaching the locations, some of which are difficult of access by motor car or airplane.

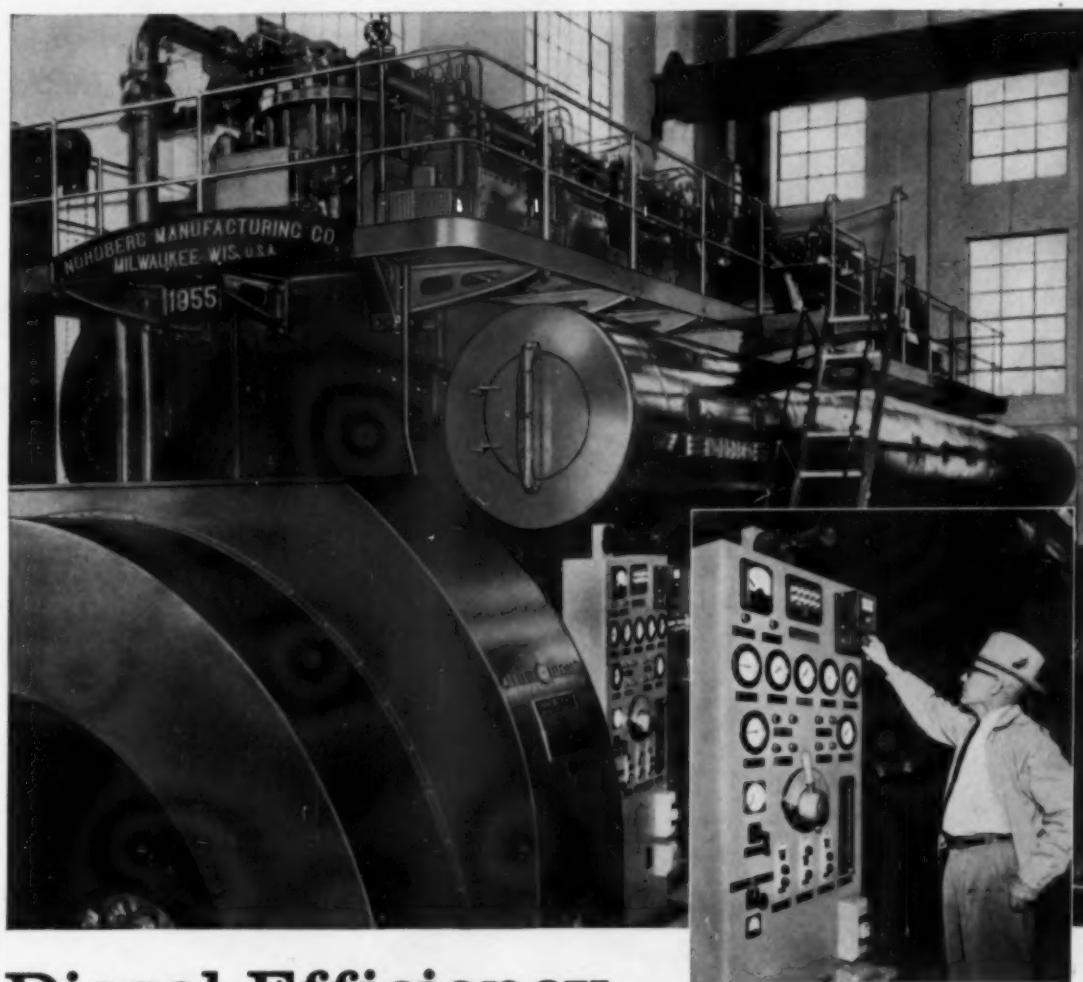
Hydraulic Turbo-Coupling

The use of heavy machinery such as mining, road construction, factory and marine equipment, subjects electric and internal combustion engines to the danger of overloading during the starting-up process. To eliminate this, a Dutch firm (Ingenieursbureau IMECO, Schaesberg) has developed a new turbo-coupling unit which permits the starting of an engine without immediate and direct drive to the machinery. Once full torque has been attained on the part of the engine, the overloaded piece of machinery is cut in, and gradually revved up. The newly developed hydraulic coupling is of the hydrokinetic variety which, in addition to a pump impeller and turbine wheel, features a supply chamber fitted to the pump impeller. This, in turn, communicates by means of two ball valves with a working chamber between pump impeller

and turbine wheel. The quantity of oil in the working chamber, which determines the power transmission, is automatically adapted to the available engine power output. The engine is not connected to the machinery during the starting-up process. When the engine has reached the required speed, the working chamber is filled from the supply chamber and a gradual connection

is established between the engine and the machinery to be driven. This unusual hydraulic turbo-coupling can be supplied in five power types: 0-15 hp, 20-40 hp, 40-70 hp or 70-130 hp at an engine speed of about 1,450 rpm, and as a 130-500 hp heavy duty type. For further information, contact the Netherlands Trade Commission, 551 Fifth Avenue, New York 17, N.Y. ITS NEW

READY NOW! The completely new 1960 edition of the **DIESEL AND GAS ENGINE CATALOG**, Volume 25, can now be purchased. If you design, purchase, sell, operate or service diesel, dual fuel, or gas engines, the Catalog is essential to you and your business. This giant, 442 page, 10½ x 13½", fully illustrated reference book has been rewritten, revised and brought up to date completely from cover to cover and costs just \$10 postpaid anywhere in the world. Send checks, money orders or company orders to **DIESEL AND GAS ENGINE CATALOG**, 9110 Sunset Blvd., Los Angeles 46, Calif.



Diesel Efficiency Checked Instantly with the *Alnor* Multi-circuit Pyrometer

Most diesel power plants operating today are Alnor equipped. Either with the Alnor Pyrotac which has an automatic motor driven switch unit that monitors the exhaust temperatures of each cylinder and gives an alarm signal if the temperature varies above or below a set safety range, or with the multicircuit pyrometer, hand operated as shown here.

A turn of the knob on this Alnor Multi-circuit Pyrometer will give an instant check on the operating efficiency of each cylinder by indicating the

individual exhaust temperature.

Improper injection, blow by, stuck rings, failure of cooling, overload, or other malfunctioning of the engine can be immediately detected by checking the exhaust temperatures of each cylinder as indicated on the Alnor Pyrometer. The low cost of Alnor pyrometric instruments compared with the protection they provide for diesel installations makes their place on the control panel indispensable. That is why most diesel power plants are Alnor equipped.



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FLEET ADDS DIESELS TO SPEED CARGO

By L. H. HOUCK

IT'S not what the drivers say, it's not what the dispatcher says, it's not even what the non-committal Crouch brothers themselves do not say about the Crouch Bros. truck service that counts—it's what the shippers have to say that counts. And every year, more and more shippers in the areas of Kansas City, Chicago, St. Joseph, Oklahoma City, Tulsa and Wichita, say "Mark it Crouch Bros. They're dependable—and fast."

It's no secret that today's shippers demand freight at express speeds. To meet these needs and stay ahead of the demand, Crouch Bros. added 22 International model DCOT-405 tractors with Cummins diesels in 1960 and have two more on order. Ten new Brown refrigerated trailers using Thermo-King equipment with Mercedes-Benz diesels were also added to the reefer fleet.

Dieselization of this fleet, which now includes 80 tractors and 170 trailers started in 1956 when the first diesel was put in service. The following year six more were added, all Internationals, then six in '58, 10 in '59 and 22 in 1960.

Crouch Bros., Inc., was established in St. Joseph,



Mo., its present headquarters, in 1945 by three brothers—Ovid Crouch, president and general manager; Cleo Crouch, vice-president in charge of sales and Arthur Crouch, vice-president in charge of maintenance. Recently completed is an addition to their general office building, the Transport Building, and a maintenance and parts building.

Diesel tractors and dieselizeed reefers have been assigned to the important 500 mile run between St. Joseph, Kansas City and Chicago east-bound

which carries meat. Here dependability, speed and "on-time" schedules are important because meat is not only a perishable requiring refrigeration but it must be moved quickly from packing house to supermarket meat case.

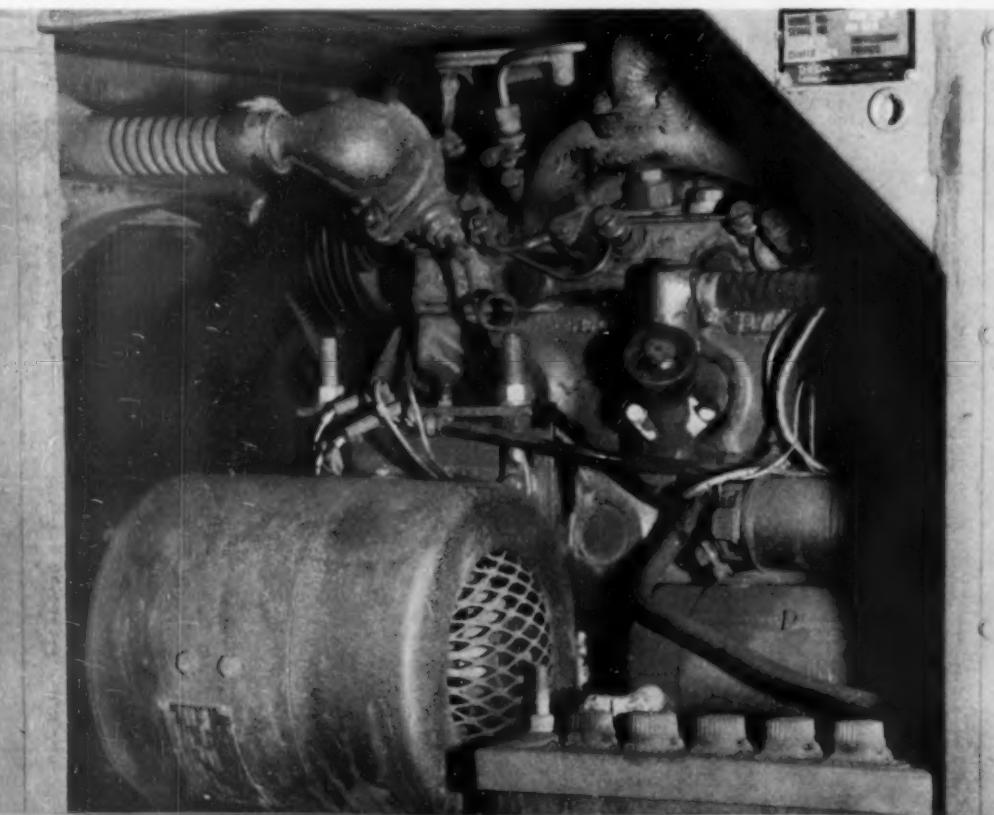
Concentration of the haul is in the areas of Chicago, Kansas City, St. Joseph, and in the complex business of orderly and profitable movement of perishable freight at express speeds there is the problem of balanced loads. There must be loads both ways. So Crouch Bros. haul meat east, candy in reefers back to warehouses in Kansas City. They haul steel from Kansas City to Rock Island and tractors from Rock Island to Oklahoma City, other tractors from Libertyville, Ill., soap products and other commodities west.

The route from St. Joseph to Chicago—U.S. 36 and U.S. 66 is an ideal highway with good paving and minimum hills. Using two drivers and sleeper cabs this run is made in 13 to 15 hrs. at the company's maximum speed limit of 55 mph.

With the diesel expansion Crouch Bros. increased their loads by going from 35 ft. to 40 ft. trailers. There is a 64,650 lb. limit in Missouri so the average payload is 35,000 lbs. in 40 ft. refrigerated aluminum trailers and 38,000 net in 40 ft. vans.

Crouch Bros. have now had a total diesel experience of 6½ million miles, with current annual diesel mileage of 3 million miles. A seven-month average just computed shows 1,658,728 mi. for the

Pod-mounted 4 cylinder Mercedes-Benz model OM636 diesel engine with Thermo King reefer unit on 40 ft. trailer.





Diesel fore and aft: Crouch Bros. fast freight unit. Tractor is International DCOT-405 with Cummins NH-220 diesel engine, 10 speed Fuller Road-Ranger transmission. Reefer is one of 10 new 40 ft. aluminum trailers with Thermo-King refrigerator unit powered by Mercedes-Benz OM636 diesel engine.

with Wagner tachometers and Lincoln "one-shot" automatic lubrication systems.

Arthur Crouch said that while they have a Clayton dynamometer in the shop, their diesel mileage has not been enough to require its use much on the diesels. The work for the dynamometer from the diesel portion of the fleet will increase, of course, as mileage accumulates.

Basically the maintenance program follows manufacturer's recommendations. They run the over-



Cab-up view of NH-220 engine in International tractor. Air cleaner is Vortox, lube oil filter is Luberfiner.

period for both the 180 hp and 220 hp Cummins engines, with a fuel figure of 5.1 mpg for the 180 hp and 5.3 mpg for the 220 hp diesels.

Selection of the International DCOT-405 tractor in the latest half-million dollar expansion, sets the pattern for the diesel fleet. These heavy-duty tractors use NH-220 and HRFB 180 Cummins diesels, Fuller RoadRanger R-96, 10-speed transmissions, V-belt pusher axles, 11 x 22.5 tires, front and rear, Vortox oil bath air cleaners with intake piped above cab and equipped with rain cap and Luberfiner oil filters.

These cab-over-engine tractors feature short bumper to back of cab dimensions, sleeper cabs, aluminum frames. Each diesel is now equipped

head every 10,000 mi., change oil and oil filter at 10,000-12,000 mi. Injector and pump service is handled at Cummins factory service stations at about 40,000 mi. Two major overhauls recently completed were made at 500,000 miles on one engine and 170,000 miles on another.

"We're very happy with our diesels," Arthur Crouch said. "Our tractors are doing well and we've had no trouble with the diesels in our reefers. As our diesel experience grows we may be able to refine our service a little but we're getting top-notch service and on-time schedules."

The 10 new Brown aluminum trailers are refrigerated by Thermo-King equipment which uses a Mercedes-Benz OM636 diesel engine to drive the Thermo-King compressor by direct connection to drive-shaft and ac generator by belt. This small diesel is a 4 cylinder, 4 cycle, vertical, liquid-cooled engine producing 20 to 36 bhp. It has Robert Bosch injection pumps, Fram filters, glow plugs for cold starts.

Back to the tractors, use of the Lincoln one-shot lubrication systems saves time ordinarily required for lube work at the shop. Each unit has fittings and piping from a central tank which needs filling only at intervals of a month or more. The lube is timed for every sixth brake application. Another change in the making is from generators to alternators. Arthur Crouch said they are trying out Delco-Remy alternators. So far the results have been satisfactory, and change-over has been simple and uncomplicated.

Crouch Bros. has a driver training program which is producing dividends in well-trained drivers on Crouch equipment, a factor expected to figure in future fuel and maintenance economies on the diesel fleet. This program is spear-headed by a full-time driver-trainer, who incidentally, consistently turns in better fuel mileage. A new driver drives with the trainer for two weeks, with the assistant trainer for two weeks and is in charge of his own vehicle only after four weeks.

Serviced and ready for night run to Chicago is battery of Internationals with Cummins NH-220 engines. Air intake pipe is brought to top of cab level, has rain cap.



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Lanphier Heads Fairbanks-Morse

Thomas G. Lanphier, Jr., 45-year old industrial executive has been elected president of Fairbanks, Morse & Co., the largest manufacturing component of Fairbanks Whitney Corp., it was announced by David Karr, president of the parent company. Mr. Lanphier, an outspoken advocate of a stronger national defense and a growth economy for America, first became associated with Fairbanks Whitney on September 1, 1960, as vice president-planning. As president of Fairbanks, Morse, he will continue to serve concurrently as a vice president of the parent company.

Fairbanks, Morse standard products include diesel engines and generators, compressors, pumps and water systems and scales and electronic weighing systems. Prior to his association with Fairbanks Whitney, Mr. Lanphier served almost 10 years as vice president and assistant to the president of the Convair Division of General Dynamics Corp. He resigned in March, 1960, freeing himself from all connection with defense contracting so that he might speak out as a private citizen against what he considered the inadequacy of the national administration's defense program. During World War II, Mr. Lanphier saw extensive service as a fighter pilot both in the South Pacific and Europe. He flew more than 100 combat missions and shot down seven Japanese planes. One of these combat victories brought death to Admiral Isoroku Yamamoto, commander of the Imperial Japanese Navy who planned the strike against Pearl Harbor. From December 1949, to May 1950, Mr. Lanphier served as special assistant to the secretary of the Air Force for Research and Development. In 1950, he was appointed a member of the Air Force Scientific Advisory Board. From May 1950, to May 1951, he was special assistant to W. Stuart Symington, chairman of the National Security Resources Board, and represented Symington on the National Security Council Senior Staff. Since 1953, Mr. Lanphier has served as president and chairman of the board of the National Aeronautic Association, which represents in the United States the Federation Aeronautique Internationale, world governing board for the establishment of international records in aeronautics.



T. G. Lanphier, Jr.

Spray Products Export Manager

Appointment of Richard H. Henry as Vice President and Director of Export for Spray Products Corp., has been announced. Mr. Henry will be responsible for the development of all export business for the corporation. Previously he was with the American Express Co. for fourteen years, during which time he lived in several foreign countries and traveled in many others. Just prior to joining Spray Products Corp. he was manager of travel for his former company.



R. H. Henry

E. L. Miller Heads DEMA

Eugene L. Miller, president of the Cooper-Bessemer Corp., Mt. Vernon, Ohio, was re-elected president of the Diesel Engine Manufacturers Association at the group's annual meeting. Re-elected as vice presidents were W. E. Butts, president, General Metals Corp., Oakland, Calif., and George Steven, general manager, Worthington Corp., Buffalo, N.Y. J. F. Huvane, Chicago Pneumatic Tool Co., was chosen as treasurer and Robert L. Stanley, Falls Church, Va., was again designated executive secretary. Chosen as directors, in addition to Messrs. Miller, Butts, Steven and Huvane were G. R. Anderson, Fairbanks, Morse & Co.; W. F. Burrows, The White Motor Co.; J. N. MacKendrick, Clark Bros., Co.; T. E. Hughes, GM Cleveland Diesel Division; E. J. Parish, Ingersoll-Rand Corp.; Otto Fischer, Union Diesel Engine Co., and R. E. Friend, Nordberg Manufacturing Co. Headquarters of the association are at 2000 K St., N.W., Washington, D.C.

New Diesel For IH Tractors



International Harvester Company has begun production of a new four-cylinder diesel engine for its International and Farmall 340 tractors. The four-cylinder power plant, built specifically for the company's 340 series tractors, furnishes 40 pto and an estimated 36 drawbar horsepower, fitting the three to four-plow tractor class. Many parts of the new D-166 engine are identical and interchangeable with parts in the six-cylinder D-282 and D-236 engines now used in IH 460, 560, and 660 series tractors. Individual glow plugs in each pre-combustion chamber enable the new direct-starting diesel to start even in zero weather. The single-rotor fuel pump responds to split-second load change and has a simple design for easy adjustment and service. Pintle-type self-cleaning injection nozzles and low friction pistons are used to increase engine economy and efficiency.

ITS NEW

Turbine Jet Starter

Solar Aircraft Company's Jupiter 500 hp gas turbine engine will go into a new jet starter unit and tow tractor designed for use aboard Navy aircraft carriers. The tractor was developed by the Frank G. Hough Co., Libertyville, Ill. It is only 36 in. high, enabling it to move under the wings of most planes. The Jupiter engine will be installed across the rear of the tractor. Compressed air taken from the compressor section of the gas turbine engine will be used to start carrier-based



jet aircraft. Air compressor versions of the Jupiter turbine are being used to start a number of military and commercial jet aircraft, including Convair's B-58 Hustler supersonic bomber and 880 jet airliner and Douglas' DC-8 Jetliner.

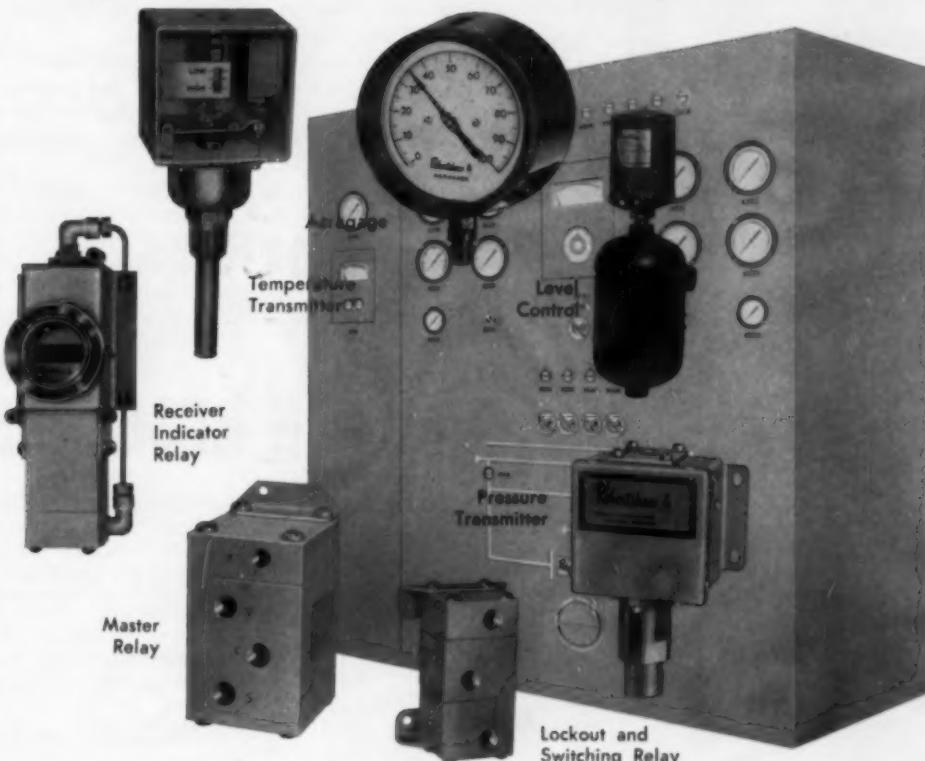
Onan OEM Sales Manager

Appointment of Robert L. Westrum as Sales Manager of a newly-created O. E. M. sales department has been announced by the Onan Division of Studebaker-Packard Corp. Mr. Westrum, an E. E. graduate from the University of Minnesota, joined Onan, electric generator maker in 1950. For the past year he has been in charge of OEM accounts, until now a division of the company's Special Products sales department.



R. L. Westrum

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Liner Plating Brochures

Two brochures now available describe the Mecrome process of diesel engine cylinder liner plating. *Let's Put the Microscope on a Mecrome Liner* describes and illustrates some of the inspection tests carried out during liner plating. *Positive Proof*, the other bulletin tells of the diesel engine user whose liner showed only .00025 in. wear after 103,000 mi. of use. Both bulletins illustrate the liner surface applied by Metal Finishers, Inc., which includes microscopic oil retention "wells" to give uniform oil distribution for superior lubrication. To obtain copies of the bulletin and for more information on the Mecrome Process write Metal Finishers, Inc., 1725 E. 27th St., Cleveland 14, Ohio.

(ITS NEW)

Truck Lease Meeting

Plans for the business and social program of the 1961 Spring Executive Conference of National Truck Leasing System, to be held at the Boca Raton Hotel, Boca Raton, Florida, March 13-16, are now being finalized, according to Mr. Frank Max, Jr., of Baltimore, president of the System. Working sessions will largely be conducted as discussion clinics to permit ample "shop talk" bearing on management and operating prob-

lems of the lessor-companies represented at the meeting. The Conference will open with a general session, and will be adjourned Thursday noon following another general session. All day Tuesday and Wednesday afternoon, various clinic groups will be scheduled. Arrangements for the conference are being handled from the System's headquarters in Chicago by Miss Martha Dunlap, executive director.

AED Convention Set

Why the construction equipment industry's Soaring Sixties never left the ground, and what can be done to create a healthier business climate for the future will be a major theme for the 42nd Annual Meeting of the Associated Equipment Distributors, February 5-9, 1961, in Los Angeles. Over 3,000 machinery company executives from throughout the United States and Canada will convene for the five-day event. AED has lined up a distinguished array of speakers—financial experts, economists, and leading representatives from all areas of the construction business—contractors, distributors and manufacturers—to analyze where things went wrong in 1960 and to chart a course for the industry to follow in 1961. To implement these speakers, AED will stage a number of panel discussions and presentations.

(ITS NEW)

Bi-Metallic Casting Brochure

A brochure available from the Al-Fin Corporation describes the firm's process of bi-metallic casting for use in such products as engine pistons, brake drums, timing gears, cylinders etc. Al-Fin molecular bonding, first introduced in 1941, has been successfully applied to hundreds of products. In this patented casting process, aluminum and magnesium alloys are molecularly bonded to steel, stainless steel, iron and other metals. The light metal is cast against a specially prepared surface of the ferrous metal using standard casting methods. To obtain a copy of the brochure write The Al-Fin Corp., P. O. Box 293, Bethel, Conn.

(ITS NEW)

Industrial Clutch Line

The firm's line of industrial air friction clutches is described in a brochure available from the Mid-States Industrial Clutch Co. The brochure describes the units available and their features, including silicon rubber diaphragm with high temperature characteristics of 500° to 600° F, fiberglass reinforcement, adjustable self centering of torque plates and other features. Also described is a new line of Power-Flo clutches, currently in production in the 16 in. and 18 in. sizes but which will be available in a line from 8½ in. to 36 in. in the near

future. For a copy of the brochure write Mid-States Industrial Clutch Co., P. O. Box 848, Wichita, Kans.

(ITS NEW)

Transmission Bulletin

A four-page bulletin describes the 515-pound aluminum 610-ED nine-speed transmission manufactured by Clark Equipment Company's Transmission Division. Photographs show the entire unit in its aluminum casing and the selector lever and range control button in the driver's cab. A cutaway drawing shows arrangement of gears and shafts within the casing, and there is a graph plotting engine rpm against vehicle mph through the nine forward gear ratios. Specifications are also detailed. For copies, write Bulletin 610-ED, Clark Equipment Co., Transmission Division, Jackson, Mich.

(ITS NEW)

Daros Appoints Rowe

Piston Products, Inc., Skokie, Ill., announces the appointment of William W. Rowe as general manager. The company is the United States and Canadian headquarters for sales, service, engineering and warehousing of "Daros" diesel engine piston rings and cylinder liners, made in Gothenburg, Sweden, by the parent firm, AB Davy Robertsons Maskinfabrik.

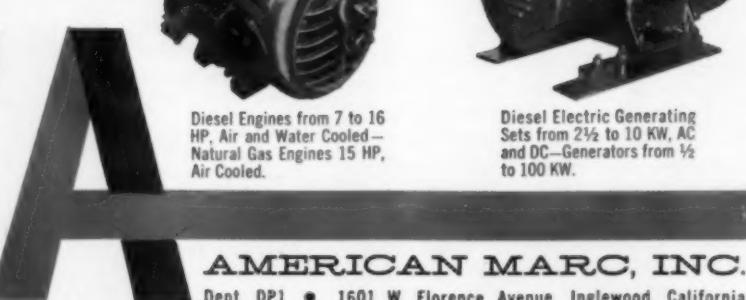
DEVELOPED THROUGH RESEARCH • PROVEN IN USE



Intensive research by American MARC brings you the benefits of ultra-lightweight diesel power in a small package. American MARC products include: Ultra-lightweight diesel engines, 7 to 16 HP, air and water cooled; Diesel electric generator sets, 2½ to 10 KW, AC and DC; Generators, ½ to 100 KW, 400 and 60 cycle, permanent magnet and static excited types; Natural gas engines, 2 cylinder, 15 HP, air cooled.

American MARC products are designed and built in AMERICA. Quality American materials and expert workmanship assure you of economical, trouble-free operation. The AMARC unconditional guarantee is supported by prompt service and ready availability of genuine American MARC parts.

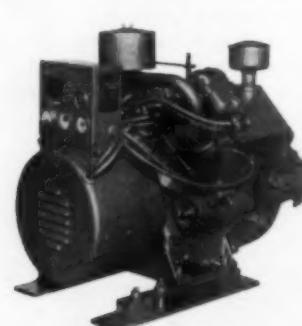
Our armed services specify only American products. Demanding positive dependability, they have standardized on AMARC diesel equipment.



A AMERICAN MARC, INC.
Dept. DPL • 1601 W. Florence Avenue, Inglewood, California



Diesel Engines from 7 to 16 HP, Air and Water Cooled—Natural Gas Engines 15 HP, Air Cooled.



Diesel Electric Generating Sets from 2½ to 10 KW, AC and DC—Generators from ½ to 100 KW.

Mid-West Diesel News

By L. H. Houck

GENERATING capacity of municipal power plant at Geneseo, Ill., has been increased from 3,331 kw to 5,251 kw, by addition of a Cooper-Bessemer gas-diesel, 12 cylinder, turbocharged, producing 2,680 hp. at 327 rpm. The new engine has taken over almost 90 per cent of plant capacity. It operates on 6 per cent pilot fuel oil for ignition, dual fuel switch is simple and automatic when natural gas is low.

INLAND GM Diesel, Inc., Milwaukee, delivered a 5043-7101, (new GM 4-53) to Aring Equipment Co., to repower a Model 85A Michigan loader.

HERCULES DD226 diesel in rock-breaking machine to Southwest Industrial Products, Inc., Oklahoma City from Driller's Engine & Supply Co., Oklahoma City.

JOHN Deere 840 2 cylinder diesel tractor with Hancock scraper to Frank White, Lawton, from Oklahoma City Equipment Co.

TWO John Deere 440ID wheel tractors with 2-53 GM diesels to G. E. Smith & Sons, Noble, Okla., from Oklahoma City Equipment Co.

NEW Waukesha and Climax dealer, Simplex Motor Parts & Service Co., Inc., 2916 N. 14th, St. Louis. Simplex, headed by Louis E. Held and Lawrence Hamilton, has been in business 25 years, and will now offer Waukesha shop and field service.

VOLVO Import, Inc., truck division, has expanded its diesel truck sales westward through Chicago and plans national coverage. It offers three diesel truck models ranging down from 195 hp such as the L-498 typical rig sold to Everett Robbins, Mt. Holly, N.J., a sleeper cab, 585 cu. in. Volvo diesel, Fuller RoadRanger transmission, Bendix-Westinghouse air brakes, Eaton axles, Spicer prop shafts, Ross steering gear, Dayton wheels, Firestone rims, Borg & Beck clutches. Volvo diesel trucks are now operating in half dozen eastern and midwestern states.

ANOTHER diesel import reports orders from several of U.S.'s largest truck companies, Leyland Motors (USA), English diesel truck builder and largest importer since 1933. Its 4 ton Claymore model has Leyland diesel mounted amidships. Leyland reports it has supplied diesels in the U.S. to 2,500 buses, supplies engines to two U.S. heavy truck builders, and earth-moving and heavy construction equipment.

CONVERSION from gasoline to diesel in a Flexible bus by Green Bay-Wausau Lines, with GM diesel from Inland GM Diesel, Inc., Milwaukee. Performance report indicates 9½ mpg.

BEN Haskins Construction Co., Corder, Okla., has taken delivery of several TS-260 motor-scrapers, some HD-21's and a model 45 motor grader from Allis-Chalmers dealer, Boardman Machinery Co., Oklahoma City.

FOUR Michigan 380 loaders to S. E. Evans Construction Co., Eufala Dam, from R. H. Young & Sons, Inc., Oklahoma City. Three equipped with Cummins NFT-6-CI, one with 12V-71 GM diesel.

LIMA model 44, 1-1/2-yd. dragline with 4-71 GM diesel to Cimarron Const. Co., Perry, Okla., from R. H. Young & Sons, Inc., Oklahoma City.

WORLD'S largest foundation drill built by Case Foundation Co., Roselle, Ill., has started to work on the \$36 million Marina City center, tallest apt. buildings in the world, Chicago. Drill is 8 stories high, weighs 130 tons, cost over \$325,000, drills 200 feet. Engine is a 350 hp. Caterpillar D-375 with Twin Disc torque converter, Westinghouse air controlled, mounted on Bucyrus-Erie 51-B undercarriage with swamp tracks.

LIMA 703, 1½-yd. dragline, 6-71 GM diesel with Allison torque converter to Smith Road Co., Nowata, Okla., from R. H. Young & Sons, Inc., Oklahoma City.

TWO model M Insley cranes, one with Continental, other with Minneapolis Moline, both converted to L-P gas to Moore Bridge Co., Ada, from Oklahoma City Equip. Co.

RESCUE craft has been powered with an 8V-71 GM diesel by Marinette Marine Corp., Marinette, Wis. Delivery by Inland GM Diesel, Inc., Milwaukee.

CONVERSION of a fleet of Ford trucks used as haulaway units, has begun with delivery of first contingent of GM 6V-53 185 hp diesels from Inland GM Diesel, Inc., Milwaukee, to Speedway Transports, Inc., Kenosha.

BUCKEYE Ditcher, model 318, with 318 Caterpillar diesel to Vaughn & Taylor, Odessa, Tex., from Oklahoma City Equipment Co.

TWO model 820 John Deere tractors, 2-cylinder John Deere diesels to Peter Kiewitt & Sons, from Oklahoma City Equipment Co.

New Gasket Compound

A new gasket compound is available for leakproofing, gasketed assemblies. It also can be used to repair broken gaskets, for building up damaged, misaligned or warped flanged surfaces, or as a gasket substitute where surfaces permit. Known as Seal-Last, the new gasket compound can be used for a wide variety of industrial fluids and gas services, including water, steam, oil or water-based hydraulic fluids, L-P and natural gases, petroleum products, mild corrosives and many chemicals. Temperature range is from -65° to +400° F., pressures to 5000 psi. For complete information contact Crane Packing Co., Dept. DP-6, 6400 Oakton Street, Morton Grove, Ill.

ITS NEW

Clayton
SERIES CT CHASSIS
DYNAMOMETER
for POWER TESTING

DIESEL or GASOLINE VEHICLES

150 TO 800 H.P.

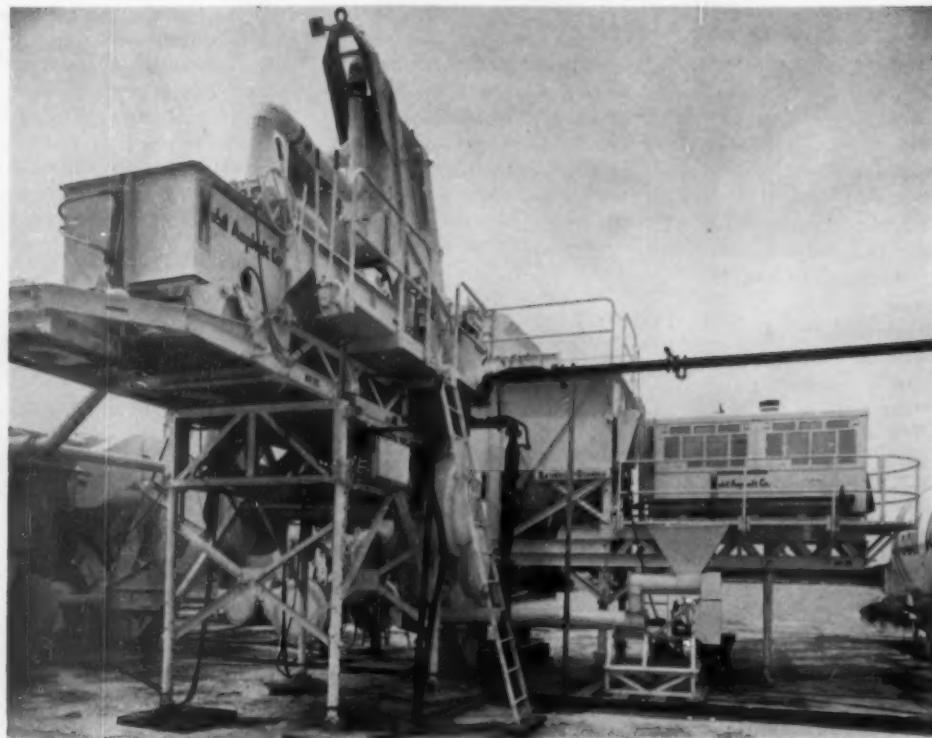
SINGLE OR MULTI-AXLE DRIVE

Here's the equipment to *accurately* measure performance under all driving conditions without leaving the shop! Handles all vehicles including medium and heavy duty trucks, single or multi-axle, of from 150 to 800 Road Horsepower with axle loadings up to 22,500 lbs. per axle. Complete FULL POWER tests can be made in a matter of minutes. Clayton infinitely variable load control duplicates road conditions at *any* speed, maintaining any desired torque load on gas, diesel, or L.P.G. engines.

The Clayton Series CT Chassis Dynamometer is indispensable in modern maintenance, overhaul, and service repair operations. Testing with this equipment assures accurate diagnosis, reduces road failures, cuts "down-time" delays, increases shop productivity, provides quality control for all performance-type repairs and maintenance checks, eliminates most driver complaints, assures specified performance and minimum operating costs. Write today for the Series CT catalog (form C-1045).

312

Clayton
MANUFACTURING COMPANY
443 N. TEMPLE CITY BLVD.
EL MONTE, CALIFORNIA



An overall look at the new plant of the Mobile Asphalt Plant. All of its power needs except for over the road transportation is supplied by a 100 kw Caterpillar dieselize generating set and three other Caterpillar engines with power take-offs.

Mobile Asphalt Plant

Mobility is the outstanding feature of the new asphalt plant constructed by Barber-Greene for the Mobile Asphalt Co., a subsidiary of South Florida Asphalt Co. of Fort Lauderdale. Designed to help construct roads in the roughest terrain and under all conditions, its capacity is 240 tons per hour. The entire plant from manufacturing the asphalt to supplying lights in the crews quarters depends on four Caterpillar diesel engines. Traveling to a new job site the plant, which is painted white with color coding for safety, maintenance and erecting, will stretch out for about two miles along the highway. It can be dismantled, moved to a new job site, erected and ready for manufacturing or in the parlance of the asphalt business, "from smoke to smoke" in 36 hrs. Most of the equipment is self erecting and the company carries its own highway portable, hot oil, storage tank. Electrical power is supplied by a model D326 series F Caterpillar diesel generating set with an 1800 rpm, 60 cycle, 125 kva, 100 kw, 300/150 amp. generator. The unit also has two additional D326 series F Caterpillar diesel engines, rated 200 hp at 2000 rpm with power take-offs, to run the mixer and gradation units plus a Model D337 Caterpillar diesel which is used to run other component units of this "circus plant." Two over the road trailers accompany the plant. One is the office and shop and the other has living facilities and storage space.

Injection Nozzle Analyser

A new diesel nozzle analyser which includes features for fast and accurate testing is now being manufactured by Leslie Hartridge, Ltd., London. The analyser is being distributed in the U.S. by Diesel Injection Sales and Service, Norfolk, Va. The unit is powered by compressed air and is delivered ready for connection to an existing air supply with an operating pressure of 80 psi. The machine tests injector nozzles by application of a continuous flow of high pressure oil in a range from nil to full demand of the nozzle orifice. Injection period lengths can be controlled so the operator can see the action of the needle throughout the period from lift to return to the body of the seat together with degree of needle oscillation at

any time in its lift. Patented injector clamps eliminate delivery pipe and nut connections and both time and pressure readings can be taken simultaneously with the aid of an indicator. Controls are conveniently placed at the front of the unit and include an oil flow regulating valve, pressure isolating valve, pressure-accumulator valve and the indicator push button switch. A large spray cabinet is inside the machine and is fitted with transparent sliding doors which allow unobstructed observation of spray patterns. The cabinet is ducted to an electric fume extractor or it can be vented to an existing duct system. For information on the models available and further information, write Diesel Injection Sales & Service, Norfolk, Va.

ITS NEW

New Personnel Appointments

Burgess-Manning Co., Dallas, has announced several new personnel assignments in its industrial silencer division headquarters in Dallas. H. A. Dietrich, vice-president and manager of the division, has transferred to Dallas from Libertyville, Ill., former headquarters for the division. Mr. Dietrich was manager of the division when it was headquartered in Libertyville. A veteran sales executive with the company, he joined the acoustics division of Burgess Battery Co. in June, 1935. That division later became the Burgess-Manning Co. A. P. Gallagher has been promoted from chief engineer to engineering coordinator in Dallas. He will be responsible for all engineering within the division. Gallagher has been with the company since 1945. Edmund J. Halter recently joined the company as chief development engineer in charge of the division's research and development program in Dallas. Promoted to the position of chief application engineer was Bill Golden, Dallas. He



H. A. Dietrich



A. P. Gallagher

is responsible for all field surveys and application recommendations. Golden joined the company in 1957 as an application engineer. Carl Read, Jr., the company's office manager in Dallas, has been appointed advertising manager.

Luber-finer Filter on Arctic Express Tractor

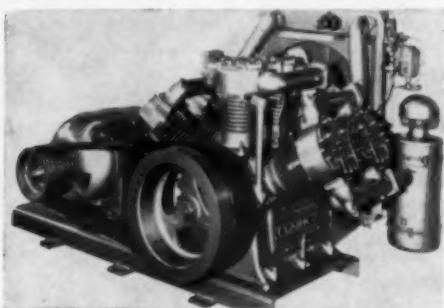
In a picture caption on page 52 of our January issue the lube oil filter installed on the Mack tractor operated by Arctic Express, Inc., was incorrectly identified. The filter shown on the tractor, below, is manufactured by Luber-finer, Inc.



DIESEL AND GAS ENGINE PROGRESS

25-100 BHP Air Compressors

A new line of 100 lb. air compressors in the 25-100 hp range has been introduced by Clark Bros. Co. Designated the C-Line, these two stage, air cooled units are designed for compactness, durability and high efficiency. Complete air cooling eliminates the need for cooling water duty as well as the extra weight and expense of water jacketing. Two stage compression, intercooling between stages, generous valve areas, large air passages and good mechanical efficiency are combined to produce high compressor efficiency. As a result, substantial savings are achieved in power consumption. Compressor cylinders operate at very conservative piston speeds to assure optimum efficiency and long life. Of the single acting type, both high and low

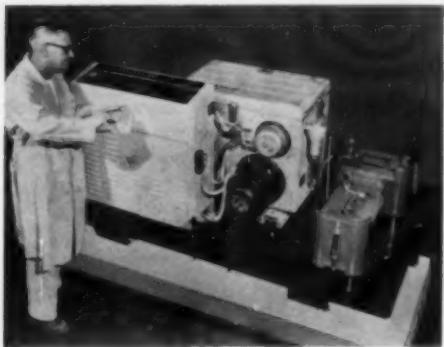


pressure cylinders are cast of iron alloy and individually removable. The outer surface is finned in proportion to heat removal duty. Only four cylinder sizes cover the complete line of compressors, thereby permitting unusual interchangeability of parts and minimizing replacement inventories. Intercoolers are the fin and tube, single pass type, with extra large cooling surfaces for greater efficiency. The copper alloy core sections can be readily removed for cleaning or replacement if required. A heavy duty induction type fan, belt driven off the crankshaft, assures ample air flow through the cooler and over the cylinders. Built in 25, 50, 75 and 100 bhp sizes, Clark C-Line Compressors are available as a basic compressor, base mounted compressor less motor, or complete base mounted package including electric motor drive. Detailed information can be obtained by requesting new Bulletin 203 from Clark Bros. Co., Olean, N. Y.

ITS NEW

Ship "Mercury" Turbines

Solar Aircraft Co. has shipped the first of two Mars gas turbine-powered auxiliary power units to be used in Project Mercury, the manned orbital flight program conducted by the National Aero-



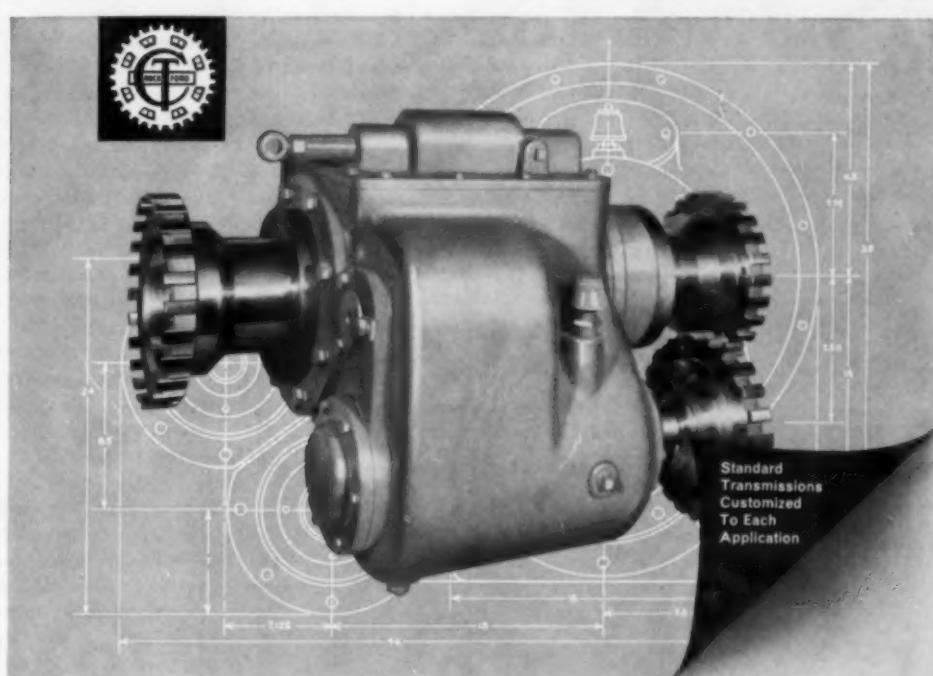
nautics and Space Administration. The APU's were ordered by the Radio Division of The Bendix Corp. They will be used in conjunction with the instrumented aircraft which are employed to test the ground communications and tracking systems of Project Mercury. Light and compact, the APU's will be transported by the aircraft to remote stations and will supply the power needed to check out the electronic equipment in the test aircraft. Solar Mars 50 hp gas turbine engines power 30 kva ac generators in each of the units. They are also equipped with control consoles. Project Mercury is a program slated to place a manned capsule in orbital flight around the earth and then safely recover the capsule and its occupant upon re-entry into our atmosphere.

New Burgess-Manning Director



T. P. Walker

Tom P. Walker, Houston former chairman of the board of Transcontinental Gas Pipe Line Corp., has been elected to the board of directors of Burgess-Manning Co. Mr. Walker, who retired from Transco in 1958, also is a former president of the pipe line company. He continues as a member of the Transco board also. Burgess-Manning has three divisions—Industrial Silencer, Architectural Products, and Penn Instruments.



Use full engine power for truck travel or auxiliary equipment with Cotta split-shaft power take-off

Need truck mobility to transport auxiliary equipment quickly . . . plus full engine power for pumps, winches, electric sets, and compressors after they arrive on the job?

Cotta's split-shaft power take-off transmissions lead full engine horsepower to rear axles, or to auxiliary equipment when heavy loads demand it. Auxiliary engines can be eliminated. Reduced gear loads and constant mesh gears on both shafts prolong equipment life.

PTO flexibility — Standard truck transmission ratios combine with Cotta's split-shaft ratios to provide exceptional drive

flexibility for road travel or PTO performance. Customized gear-ratio variations are available for individual jobs.

Parts availability — Guaranteed Cotta parts and service keep your equipment on the job. Round-the-clock expediting of gears or shafts means delivery in hours after your order is received.

See our catalog in *Sweet's Product Design File*. Check the descriptions of standard and custom applications. Then call Cotta (TWX-RK 7720 or phone WO 4-5671) for complete details.

COTTA
HEAVY-DUTY TRANSMISSIONS

COTTA TRANSMISSION CO., ROCKFORD, ILL.



Florida Diesel News

By Ed Dennis

ONE of the star attractions at the Miami International Boat Show will be Dick Bertram's new "V 31" sports fisherman. The craft, constructed of reinforced fiberglass, is powered by a pair of General Motors 4-53 marine diesels rated 130 hp each and 2:1 Borg-Warner r/r gears which gives it a speed of 32 mph.

FROM Gulf Coast Engine Sales of Tampa we hear about the *Collegiate Rebel* a 124 ft. power sailer of Tampa. This research vessel recently completed a 'round the world cruise. For propulsion it uses a six cylinder model 16000 Allis-Chalmers marine diesel engine. Also in the engine room is a model 273 Allis-Chalmers 15 kw diesel generating unit. This former WWII floating naval radio station is presently manned by college students doing research work.

WITH the recent addition of the 360 ft. *M V New Yorker*, the Erie & St. Lawrence Corp. will have two container ships in operation for coastal shipping between Port Newark and Florida ports. Both vessels are powered by twin 2100 bhp Enterprise diesel engines and Enterprise dieselizeled 400 kw Electric Products generators.

UP at Jacksonville the Hickins Yacht Corp., launched the 58 ft. *Shadow* for Mr. Hilkor and powered it with a pair of General Motors 6-71 marine diesel engines, 1:1 Allison hydraulic r/r gears and 1.38:1 Huckins "V" drive.

THE dredge *Barlow* currently dredging the new Miami harbor has two dieselized tugboats and tenders: The 54 ft. *Minnie S* with a 400 hp Caterpillar marine diesel and the 44 ft. *Julie* with a five cylinder 150 hp Fairbanks-Morse diesel plus a six cylinder General Motors series 71 on one of the work barges.

THREE 24 ft. work boats powered with General Motors 4-53 diesel engines and Borg-Warner 2:1 r/r gears from the Jacksonville Br. of Detroit Diesel Div. were delivered to the E. I. DuPont Co. at Lawtey, to be used as dredge and personal vessels.

TWO Caterpillar, model D333 A. T. A., marine diesels were installed on Firestone's *Tireless*, a 44 ft. Rybovich built sports fisherman. These new six cylinder Caterpillar marine diesels, supplied by Shelley Tractor & Equipment, have a bore and stroke of 4½ by 5½ in., with the turbocharger and aftercooler they develop 270 hp each at 2200 rpm. Twin Disc, model MG-508, 1.5:1 r/r gears were also included.

THE *Sheila B*, a 32 ft. pleasure boat out of Jacksonville, had a GM model 3-53 diesel engine with Borg-Warner 2:1 r/r gears installed at Southern Marine Co., Jacksonville. It was engineered by the Jacksonville Br. of Detroit Diesel Div.

CUMMINS Diesel Sales Corp. in Hialeah supplied the two model NH6M, 6 cylinder, 5½ x 6 in. diesel engines, each rated 143 hp at 1800 rpm or 220 hp at 2100 rpm, along with Twin Disc MG-512 4.4:1 r/r gears for Al Start's new stern wheel show boat at Fort Lauderdale.

AT the J. F. Bellinger Shipyard in Jacksonville, the *Four Seasons*, a 128x30-x13 ft. ex-tuna clipper, with a six cylinder Union diesel. This 14x19 diesel is rated 560 hp at 325 rpm. Also included are two 3-268 GM 100 kw generating units and a one-cylinder Lister Blackstone diesel. The vessel was being outfitted for fishing in the Persian Gulf.

THE 86 ft. *Percheron* was recently added to the Miami Towing Co.'s fleet of tow-boats. It is powered with a V-12, GM 567 diesel rated 1200 hp and Falk 2.5:1 r/r gears which turn a 88x61 four blade propeller. Also included are Cuno strainers and Briggs filters plus two 30 kw GM diesel generating sets.

THE 36 ft. *Flo-Jo* of Clearwater, has two GM 4-53 marine diesels and 1.52:1 Borg-Warner r/r gears to turn the 17x18 three blade propellers for a speed of 18 knots at 2500 rpm.

UP at Largo the newly launched *Helen Marie*, owned by F. L. Haas, was powered by a model HR-6-M Cummins diesel rated 175 hp at 1800 rpm from Cummins Diesel Sales, Tampa. Also included was a model HYC 6900 Capital marine gear.

SHELLEY Tractor & Equipment engineered the Caterpillar marine diesel engines on the twin screw 49 ft. *Gigi II*,

a sports fisherman owned by Republic Aviation. These turbo charged D333 "Cats" have after coolers and are rated 270 hp at 2200 rpm. Also included were Twin Disc 1.5:1 r/r gears.

THE Miami Br. of Detroit Diesel Div. supplied the GM V6-53 marine diesel engine, with 2:1 Borg-Warner r/r gears, for Bob Perrine's Chris Craft. The engine is rated 195 hp at 2800 rpm.

Jean-Marie, a 65 ft. shrimp trawler, owned by A. W. Jones of Jacksonville, had a Cummins HR-6-M diesel, rated 127 hp at 1800 rpm, and Twin Disc 4:1 r/r gears installed. The vessel was launched at Fernandina Beach recently. The unit came from the Jacksonville Branch of Cummins Sales.

TWO model O M 636 Mercedes-Benz diesel engines were installed in a 35 ft. catamaran owned by Mr. Paxton of Fort Pierce. The engines drive 10 kw Onan generators and will be used as auxiliary power for the twin hulled vessel's air conditioning and electrical system, from Power Inc. of Fort Meyers.

ALVIN C. Dickey of St. Mary's, Ga., repowered his 22 ft. inshore shrimp vessel, *Restless*, from gasoline to diesel with a GM 3-53 diesel and Borg-Warner 2:1 r/r gears. The Jacksonville Br. of Detroit Diesel Div. supplied the diesel engine.

FRANK Oliver of Palatka's new 65x26 ft. tug is powered by a pair of Cummins 600 hp diesels. These VT-12 engines have Capital 5:1 r/r gears. Bellinger Shipyard at Jacksonville built the hull.

HUCKINS Yacht Co. of Jacksonville, launched the 64 ft. *Maggie* and powered it with a pair of GM 12V-71 diesel engines rated 335 cont. hp at 1800 rpm, from Jacksonville Br. of Detroit Diesel Div. Installation also included 1:1 Capital gears and 1.38:1 Huckins "V" drive.

Roller Chain Catalog

A new stock roller chain, sprocket and coupling catalog (No. 760) carrying new ARSCM horsepower ratings has been issued by Diamond Chain Co., Indianapolis. Diamond's new "760" catalog, in addition to engineering data on stock roller chain and sprockets, gives full information on Diamond's new products in the power transmission and conveying field. These are the "Dura-Weld" top plate conveyor chain, "Tuf-Flex" heavy duty roller chain, "Micropitch" miniature roller chain, and "Hi-Cap" flexible couplings. Copies of the new catalog are available by writing to: Diamond Chain Co., Inc., 402 Kentucky Ave., Indianapolis 7, Ind.

ITS NEW

For simplicity—safety—economy . . .

WINSLOW gas filters!

For specialized filtration of all gas fuels —
Raw well-head gas! • LP gas! • Sewage gas!

Winslow gas filters on processing plant field boosters, Oklahoma

WRITE for information on Winslow gas and oil filters.

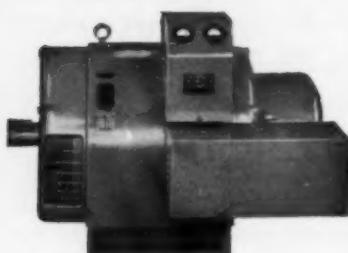
WINSLOW
ENGINEERING AND MANUFACTURING CO.
4089 Hollis St., Oakland 8, Calif., OI 2-0280
Export Division: Oceanic Export, San Francisco • Epsom, France • London, England

Michigan-Ohio News

By Jim Brown

WASHTENAU County, Mich. has accepted delivery on a Northwest model 25-D dragline equipped with a $\frac{1}{4}$ -yd. Page bucket and powered by a GM 3-71 diesel engine. The sale was made by Cyril J. Burke, Inc. of Detroit.

If you hate maintenance, you'll like E-M's new
BRUSHLESS "Packaged" Generator
BEMAC
(Brushless Excited Magnetic Amplifier Controlled)



BEMAC is available in ratings of 10 thru 150 kw, 3 phase; 10 thru 100 kw, 1 phase; 1200 and 1800 rpm; 0.8 PF; 60 cycles; broad-range voltages of: 120/208-139/240 and 240/416-277/480 volts, 3 phase; 120/240 volts, 1 phase.

NO COMMUTATOR! NO SLIP RINGS! NO BRUSHES!

Here is a generator that is *practically maintenance-free*. It requires no servicing other than an occasional bearing check. Efficient, reliable, ageless silicon diodes rectify the exciter a.c. to d.c., eliminating the need for commutators, brushes, and slip rings. There are many advantages:

Better suited to dusty, corrosive atmospheres. No electrical parts subject to wear and damage from dust and dirt.

Safer in hazardous atmospheres. No moving electrical contacts. Sparking is eliminated.

Easier to operate. No complicated adjustments—anyone can operate BEMAC.

Magnetic amplifier regulated. Voltage regulation is automatic. A unique static voltage sensing circuit gives $\pm 2\%$ regulation.

"Rock-Steady" voltage makes your motors, lights, and electronic equipment work better.

Starts big motors. Built-in voltage boost transformer makes big motor starting easier.

Simple to install. BEMAC is self-contained, completely factory assembled.

Publication 255 tells how BEMAC Generators work. Write for a free copy and call your E-M Field Engineer.



ELECTRIC MACHINERY
MFG. COMPANY
Minneapolis 13, Minnesota

F10-TPA-219

WOLVERINE Tractor & Equipment Co. of Detroit reports the sale of an International TD-9 crawler with a Drott 4-in-1 Skid-Shovel attachment to the City of Wyandotte.

E. C. SNYDER Excavating Co. of Kalamazoo, Mich. has accepted delivery on a Universal Senior 880 Gravel Master powered by an Allis-Chalmers model 21000 engine. The portable gravel plant was purchased from the Earle Equipment Co. of Detroit.

THE J. R. Panelli Equipment Co. of Southfield, Mich. has sold a Case model 880 crawler-tractor to Farino Excavating Co., Inc. of Melvindale, Mich. The new Case is powered by a Continental HD-277 diesel engine and is equipped with a hydraulic tilt-crown blade.

CUMMINS Diesel Michigan Inc. of Dearborn, Mich. recently delivered a Cummins model LRT-6-P diesel engine to the Mesel Drilling Co., Mt. Pleasant, Mich. The new diesel will be used to power a model 214-P mud pump supplied by the Oil Well Supply Co. The Cummins LRT-6-P is rated at 300 continuous hp at 900 rpm.

THE Oakland County, Mich. Road Commission has accepted delivery on a Pettibone model 402 Speed grader from Cyril J. Burke, Inc. of Detroit. The new grader is powered by a GM 4-71 diesel, weighs 24,000 lbs., has a 12 in. mold board and is completely finger-tip operated with hydraulic controls.

SMITH Brothers Excavating Co., Inc. of Cassopolis, Mich. has accepted delivery on an Allis-Chalmers model HD-21 bulldozer. The new dozer was purchased from Earle Equipment Co. of Detroit and will be used on a project at Indian River, Mich.

THE Water Dept. of the City of Detroit has accepted delivery on a Case model 800 front-end loader with 1½-yd. bucket. The unit is powered by a Continental HD-277 diesel and was purchased from J. R. Panelli Equipment Co. of Southfield, Mich.

MOLE Construction Co. of Taylor, Mich. has accepted delivery on an International TD-9 crawler with a Drott 4-in-1 Skid-Shovel. The sale was made by Wolverine Tractor & Equipment Co. of Detroit.

CUMMINS Diesel Michigan Inc. recently installed a Cummins model NH-250-B (205 hp) engine in a Mack B-71 tandem truck. The installation was done for Ben P. Fyke of Berkley, Mich.

GINO Ianni of Detroit has accepted delivery on a Northwest model 41 pull

shovel (1- $\frac{1}{2}$ yd.) powered by a Murphy diesel engine. The unit was purchased from Cyril J. Burke, Inc. of Detroit and will be broken in on sewer work and miscellaneous excavating work in the Detroit area.

AN Allis-Chalmers model TL-16D front-end loader with a 2½-yd. bucket was recently sold to Buskirk Lumber Co. of Sandusky, Mich. The unit will be used to move logs at Buskirk Lumber, and was purchased from Earle Equipment Co. of Detroit.

BAIRLEY & Lindley, Inc. of Trenton, Mich. has accepted delivery on a Worthington model 34-E dual drum paver powered by a Cummins HBID-600 diesel engine. The sale was made by J. R. Panelli Equipment Co. of Southfield, Michigan.

A HOUGH H-90 Payloader powered by a Cummins C-175 turbocharged diesel engine and equipped with a 3- $\frac{1}{2}$ yd. bucket was recently delivered to the Broadman Valley Development Co. of Traverse City, Mich. The unit was sold by the Grand Rapids office of Wolverine Tractor & Equipment Co.

ROMULUS Township, Michigan has accepted delivery on a John Deere model 440 ID wheel-type front end loader. The unit is equipped with a John Deere model 51 multiple position backhoe and powered by a GM 2-53 diesel engine. The sale was made by R. G. Moeller Co. of Detroit.

FISHER Contracting Co. of Midland, Mich. has accepted delivery on a Northwest model 6 pullshovel (1½-yd.) with a Murphy model 20 diesel engine. The sale was made by Cyril J. Burke, Inc.

EARLE Equipment Company of Detroit has sold an Allis-Chalmers HD-115 bulldozer to Chester Moy of Minden City, Michigan.

THE Street Maintenance and Construction Div. of the City of Detroit has accepted delivery on a Worthington 210 "Blue Brute" rotary type air compressor. The compressor is powered by a GM 3-53 diesel engine and was purchased from the J. R. Panelli Equipment Co. of Southfield, Mich.

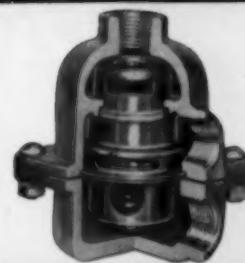
VERNON Seaman of Oscoda, Michigan has purchased a Cummins HRC4-M marine engine for installation in a 42 ft. fishing boat. The engine was purchased from Cummins Diesel Michigan Inc. and will be installed with a Twin Disc model MG-165.

GEORGE Souter Construction Co. of Detroit has accepted delivery on a Pettibone model 240 (2½-yd.) front end

loader powered by a GM 3-71 diesel engine. Distributor for Pettibone equipment is Cyril J. Burke, Inc.

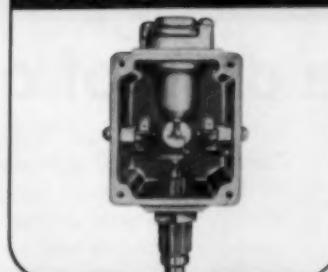
J. R. PANELLI Equipment Co. of Southfield, Mich. has sold a Worthington model 34-E dual drum paver powered by a Cummins HBID-600. The paver was purchased by Taylor Brothers Inc. of Birmingham, Michigan.

Greater ENGINE PROTECTION with Amot controls



MODEL C THERMOSTAT FOR PROPER ENGINE TEMPERATURE

A 3-way diverting valve for controlling water temperature on small diesel and gasoline, marine or stationary engines. Offers many advantages, gives rapid warm up, correct engine temperature under all loads. Made in solid marine bronze or cast iron construction in pipe sizes $\frac{1}{2}$ " to $1\frac{1}{2}$ ", with temperature settings from 75° F to 205° F. For fresh or salt water operation.



Dual Action Switch MODEL 2340 SAFETY CONTROL SWITCH FOR DUAL PROTECTION

Used to sound an alarm, flash a warning light, or shut down an engine where there is high water temperature or low oil pressure. Pressure setting adjusts from 5-25 psi; temperature ranges from low of 165° F to high of 220° F.

Write for Bulletins 131 and 387



403F FIRST ST. • RICHMOND, CALIF., U.S.A.

Miami Boat Show

The 21st Annual Miami International Boat Show will open on February 17th 1961. The show will run daily thereafter from 11 a.m. to 11 p.m. through February 22nd. Almost 200 national and international manufacturers and distributors of marine engines, boats and their accessories will be on exhibit. Fill-

ing the huge Dinner Key Auditorium, the 1961 edition of the South's boating extravaganza, will be featuring displays of large and small dieselized craft both in the auditorium and made fast to the dock outside on the blue waters of Biscayne Bay. Vying for top billing with the glamorous yachts will be the various displays put on by the diesel engine manufacturers and distributors from

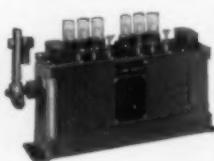
Florida and elsewhere. Waukesha Motor Co. will have their exhibit, Florida Marine Service will show the Perkins line of diesels by Chrysler, Cummins Engine along with Caterpillar will feature some of their new marine diesel engines and as usual Detroit Diesel Div. of General Motors will have their extensive exhibit. Among the dieselized generating sets to be shown will be Onan, Kohler and Universal.

HOW TO educate



a drop of oil!

Just put it through a Manzel force-feed lubricator and any oil drop knows where it's going and how to get there fast. Manzel lubricators deliver just the right amount of oil to bearings, cylinders and packings. They start, stop, speed up and slow down in perfect synchronization with your machinery...unaffected by high steam, gas or air pressure. Whatever your field, there's a Manzel lubricator to meet your needs. For our catalog, write Manzel, 253 Babcock Street, Buffalo 10, New York. Whatever your lubricating problem, you get the right answer if you



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SPECIALISTS IN LUBRICATORS AND METERING PUMPS SINCE 1898

Manzel

SNAME Scholarships

The Society of Naval Architects and Marine Engineers has announced that it will continue, in 1961, the award of scholarships for undergraduate and graduate study. The Society is receiving, at this time, nominations for the four scholarships for graduate study which it has been offering each year in the past. Application forms are being forwarded to important segments of the ship operating and shipbuilding industries, and affiliated trades, and to universities located in all sections of the country, as a matter of interest to the younger members of these organizations who may be recent college graduates. Applications should be filed with the Secretary of the Society, Captain, W. N. Landers, USN (Ret.) at 74 Trinity Place, New York 6, N. Y. before February 1, 1961, the closing date. The maximum value of each of the scholarships has been set at tuition at the College selected, plus \$1,600 for living expenses.

Amot Sales Representatives

Belen-Lynn McGuffey Co., Ltd., of Edmonton and Calgary, Alberta, have been appointed by Amot Controls Corp. of Richmond, Calif., as sales representatives for the Amot line of thermostats, valves, controls, switches and safety controls. They will represent Amot in the provinces of Alberta, Manitoba and Saskatchewan according to Charles R. Carmicheal, Amot Sales Manager.

New White Branch

Construction of a new branch headquarters for White and Autocar trucks has been announced by J. N. Bauman, president of The White Motor Co. The building, already under construction, is located on a three acre tract on Coolidge Avenue in Watertown, Mass. The new building is in line with White's long range development program which includes new factory branches and a continuing study of the trucking industry to develop new vehicles. During recent months, new branch headquarter buildings have been opened in Denver, Louisville, Cincinnati, Winston-Salem, Jacksonville and Chicago. In addition to 46 service stalls, the facility will have a chassis dynamometer, two complete lubrication areas and one wash area. The new building will also house offices, the latest in parts storage and service facilities, a machine shop with specialized equipment and completely engineered building facilities.

A-C Personnel Shifts

Carl G. Meyer has been appointed manager of the Allis-Chalmers Engine-Material Handling Branch at Atlanta. He returns to Atlanta after approximately two years, during which time he was Material Handling sales manager at the Company's Oakland (Calif.) Branch. At the time of his transfer to the West Coast, Meyer had been Material Handling sales manager at Atlanta. At Atlanta, he succeeds R. W. Summers, who recently became contact man for the Engine-Material Handling Division with all U. S. Government agencies with headquarters in the company's Washington (D. C.) office. Merrill E. Morgan has been named to succeed Meyer as Material Handling Sales Manager in Oakland, where he has been assistant to Meyer since 1957. Morgan joined Allis-Chalmers in 1956.

WORRINGTON DD-5

425 HP @ 360 RPM DIESEL and NATURAL GAS COMPLETELY REBUILT. SELL OR LEASE

Manufacturer's Equipment Co.
1836 Euclid, Cleveland 15, O.

Diesel Specialists Meet

Dates of the 11th regular meeting of the Association of Diesel Specialists have been changed from February 16-19 to February 23-26, 1961, according to an official announcement from H. B. Sirotek, president of the Association. The meeting site of the A.D.S. coming convention is unchanged. All meetings will

be held at the Granada Hotel and Inn in San Antonio, Tex. For further information, please write to Executive Headquarters, The Association of Diesel Specialists, 633 East 63rd St., Kansas City 10, Mo.

Safety Control Brochure

Amot Controls Corp. has completed an 8½" x 11" 4-page brochure in color describing Amot model 2800A safety control for low cost protection of diesel and gas engines. It is a mechanical unit used to guard against operation under excessively high water temperature or low pressure. The brochure is complete with diagrams showing four variations of installation, dependent upon desired function in connection with shut-down mechanism. Model 2800A brochure is available upon request to Amot Controls Corp., P. G. Box 1707, Richmond, Calif.

ITS NEW



PROVEN
for 30 years
to REDUCE maintenance,
operating costs and
extend engine life

- STOPS CARBON BUILD-UP
- STOPS STICKING VALVES
- STOPS RING WEAR
- STOPS CORROSION
- STOPS SLUDGE AND VARNISH

LUBAL BLENDING AGENTS used in diesel fuel, gasoline and lubricating oil will minimize down time and excessive overhauls. They are specifically compounded to eliminate the causes of pre-ignition, remove carbon abrasives in the fire zone area, and thoroughly lubricate the critical upper cylinder area. Use LUBAL for bulk treatment or for individual engines.

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BLENDING AGENTS FOR DIESEL FUEL, GASOLINE, LUBRICATING OILS, AND HEATING FUEL

DIVISION OF JOHN HOLT & COMPANY, INC.
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ITS NEW

Sales Engineer

The Chromium Corporation of America has announced the appointment of John Carl Ostrowski as sales and service engineer covering the New England and Eastern seaboard territory.

HERE'S CRAFTSMANSHIP

...YOU
CAN
see!



... better surface finishes, beveled inner edges, closer tolerances, finest Swedish charcoal iron — plus many other DAROS refinements. Results? Improved sealing, longer wear, and greater fuel economy. Yet, you pay no more for DAROS quality!



Piston Products, Inc. makes sure you get the right piston ring for your application. Send for free booklet for practical, field-tested data on selection and application of replacement piston rings in large bore diesel and gas-burning engines.

Inquiries invited from sales representatives



PISTON PRODUCTS, INC.

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ENGINES		VESSELS	
MOTORS	PUMPS	MARINE POWER	
		BUDA DA100	BUDA DD
		late type head, 55 H.P., 2:1 Gears, Like New	\$450
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		300 H.P. 2.5:1 Gears	\$1000
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		315 H.P. Direct Rev. New	\$6500
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**D.P.S.
THERMOMETERS**

These instruments are a series of marine type thermometers designed for all diesel and oil plant uses—water or oil.

FEATURES: All brass construction, nickel finish, cork insulation.

(Repair service available)

No. 416H No. 426F
Price \$6.75 or \$5.70
40 years continuously in the diesel engine business.

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DIESEL PLANT SPECIALTIES CO.

for all wearing surfaces where
FREQUENT REPLACEMENT is required

INSIST ON **M-C-M** chrome plating

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THE ORIGINAL SPRAY STARTING FLUID*



*Starts diesel and gasoline engines (from the smallest to the largest) down to 65° F. below zero • Starts in seconds • Excellent in humid weather too • Millions of cans sold • See your automotive jobber

*The inventors of spray starting fluid. Patent No. 2,948,595

Ask for the can with the "bulky donkey" trademark

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NEW SERVICE MANUALS MEET OPERATORS' NEEDS

MANUFACTURERS today invest very substantial sums of money to keep truck and equipment operators alert and fully informed on the proper application, operation and maintenance of engines, drive equipment and auxiliaries. One good example of intensive work in this area is the comprehensive series of publications published by Fuller Manufacturing Co. on the use and maintenance of its transmissions.

Back in 1922, when it had already been in business for 20 years, Fuller, then named Fuller & Sons Manufacturing Co., issued a 12-page Lubrication and Operation Manual for its transmissions. Including a section entitled "The Secret of Silent Gear Shifting," this booklet also touched upon the matter of transmission maintenance: If (the transmissions) dismantled for replacement, or other reasons, it is very important that every precaution be used in reassembling the parts correctly. All replacement of parts should be done by a competent mechanic familiar with transmission and clutch work otherwise trouble is apt to follow."

Now, 38 years later, the approach is much different. An example of this is Fuller's 100-page Service Manual for the model R-1550 RoadRanger transmission. This book—containing 348 photographs and drawings, 344 more than its aged predecessor—is but one of the many similar books issued by Fuller providing owners of Fuller transmissions specific and comprehensive information on maintenance and repair of each of the popular models. Covered in the R-1550 RoadRanger Service Manual are such topics as description of the operat-

ing principles of the transmission, instructions for proper operation, specifications, lubrication and periodic maintenance recommendations, trouble shooting instructions, both general and detailed disassembly and assembly instructions, and recommended inspection procedures.

Four recent Fuller publications, totalling 216 pages, provide similar step-by-step descriptions of all maintenance procedures for the model R-1160 RoadRanger, the 5-G-1520 off-highway transmission, eight models of 10-speed 2-shaft transmissions and four models of 5-speed truck transmissions. These new manuals provide a total of 612 illustrations covering operation, lubrication, maintenance and repair of the transmissions. Augmenting Fuller's complete range of service manuals are many other pieces of literature, including conversion manuals and cable installation instruction folders, driver instruction booklets and tags, and general literature which pertains to all Fuller models. The company has also produced several motion pictures to supplement instruction literature.

Industry has come a long way since 1922, when a mechanic could disassemble a transmission with a monkey wrench. Today's trucks and tractors are immeasurably better, and so are component parts such as engines, suspensions, tires and transmissions. Together with increased performance and durability goes added complexity. And it is good to know that companies such as Fuller will continue to serve the owners, drivers and mechanics with the best in service information as more detailed procedures and instructions are required.

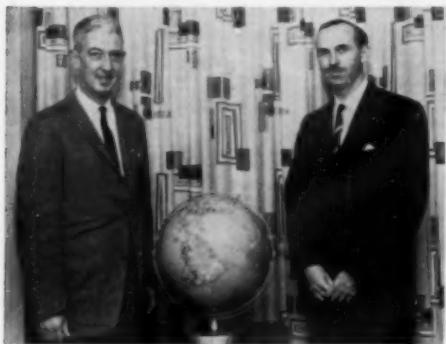
Manuals explain, step-by-step, how to maintain and repair each model of transmission. Here mechanic removes reverse gear shift with an impact puller.



DIESEL AND GAS ENGINE PROGRESS

Alco, Paxman Agreement

An agreement has been announced by W. S. Morris, president of Alco Products, Inc. (formerly American Locomotive Company), of N. Y., and Geoffrey Bone, managing director of Davey, Paxman and

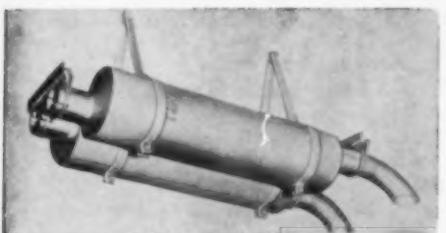


John P. DeLaney (left), vice president in charge of international operations for Alco Products, Inc., is shown with Geoffrey Bone, managing director for Davey, Paxman and Company, Ltd. during a recent visit by Mr. Bone to Alco's Schenectady, N.Y. plant.

Company, Ltd., Colchester, England of the Ruston Group, under which the two firms agree to collaborate on diesel engine design and manufacture for world markets. Under the agreement, Paxman will have the right to manufacture and sell Alco diesel engines outside the United States. Alco, in turn, will have at their disposal the experience of Paxman on diesel engines of a type and size not presently manufactured by Alco. In this connection, Alco, for example, will have the right to make and sell Paxman engines of Ventura and other types in the United States for oil-well drilling rigs, diesel-electric power packages and for application in locomotives of sizes other than now manufactured by Alco.

Special Muffler Kit

A new, special, dual muffler kit for the White 3000 series engines with 386-451 cu. in. displacement is now available in the Engine Mated Sound



**SAVE MONEY
WITH
Interstate**
diesel service incorporated
2093 East 19th St., Cleveland 15, Ohio

America's largest GM fuel injector rebuilder

Sentry line of mufflers manufactured by Alexander-Tagg Industries, Inc. According to the manufacturer, the set provides 35 per cent less back pressure, 25 per cent reduction in noise level, reduced exhaust temperature, longer muffler and manifold exhaust pipe life and better performance, resulting in lower cost per ton mile for the operator. The "Engine Mated" feature means the kit is matched to the cubic inch displacement of the engine. For further information and test record on the W-451 Kit for White 3000 Engines—Write Alexander-Tagg Industries, Inc., Hatboro, Pa.

ITS NEW

New Industrial Tractor

Designed for general purpose highway and construction jobs, a new series of wheeled industrial tractors, named the Big Mo has been announced by Minneapolis-Moline. Powered by a 206 cu. in. Moline-built diesel engine, the Big Mo 500 develops 50 bhp at 1750 rpm. Instant shifting and reverse speeds with the Big Mo 500 reverse shuttle gear accelerate loading work by approximately 50 per cent. Reverse speeds up to 18.22 mph are 25 per cent faster than forward speeds. Moline engineers assert. Five forward speeds range from 2.63 to 14.57 mph, with the five reverse speeds ranging from 3.29 to 18.22 mph. The double constant running, direct-coupled hydraulic pumps are mounted at the rear and operate the loader, backhoe, other attachments and the power steering.

ITS NEW

Double Target Pyrometer



A new double-target temperature indicating controlling pyrometer, the N-15 Pyrotroller, has been introduced by the Alnor Instrument Co. The electronic on-off controller provides a second control point for secondary or additional action. For instance, besides controlling temperature, the N-15 Pyrotroller also could independently open and close a valve, or turn a motor or blower on and off. The controller is available in eleven ranges from 0-400°F. to 0-3000°F., as well as an environmental test chamber range of -100° to +300°F. For more information, write to Alnor Instrument Co., 418 N. LaSalle St., Chicago 10, Ill.

ITS NEW

MURPHY

**Why use TWO . . .
when ONE does the job better?**

Years ago folks commonly used:

 Accurate indicating gauges and . . .  . . . the so-called "mystery box" safety switches.

The trouble was that this method required double inventory, double installation costs, and frequently led to double trouble because there were two instruments that could go wrong.

And the way they found a safety switch was faulty was when an engine burned out.

 O-27
OIL
PRES.
\$9
user
price

 SR-21
WATER
TEMP.
\$9
user
price

But Murphy combined the safety switch with a precision gauge and cut these former costs in half!

Now the gauge offers VISUAL PROOF the safety switch is working . . . and the safety switch PROVES the gauge is working. Simple?

Send us your equipment protection or automation problems . . . or write for FREE catalog.

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MANUFACTURER, INC. RANCH ACRES STATION TULSA, OKLAHOMA
MURPHY SAFETY SWITCH OF CALIFORNIA 11812 Davenport Road • Los Alamitos, Calif.

WIPE OUT

Maintenance Costs!
Specify
THOMAS
FLEXIBLE COUPLINGS

Troublesome maintenance and lubricating problems are eliminated when you specify Thomas "All-Metal" Flexible Couplings to protect your equipment and extend the life of your machines.

Like a thief in the night an inadequate coupling causes wear and damage to your machines — resulting in high maintenance costs and costly shut-downs.

UNDER LOAD and MISALIGNMENT
only THOMAS FLEXIBLE COUPLINGS
offer all these advantages:

- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- Unaffected by High or Low Temperatures

NO MAINTENANCE
NO LUBRICATION
NO WEARING PARTS
NO BACKLASH

Write for Our New
Engineering Catalog 60

**THOMAS FLEXIBLE
COUPLING CO.**
WARREN, PENNSYLVANIA, U.S.A.

INDUSTRIAL COUPLINGS
Compressor Drives
Pump Drives

DIESEL ENGINE COUPLINGS
Main Drives
Auxiliary Drives

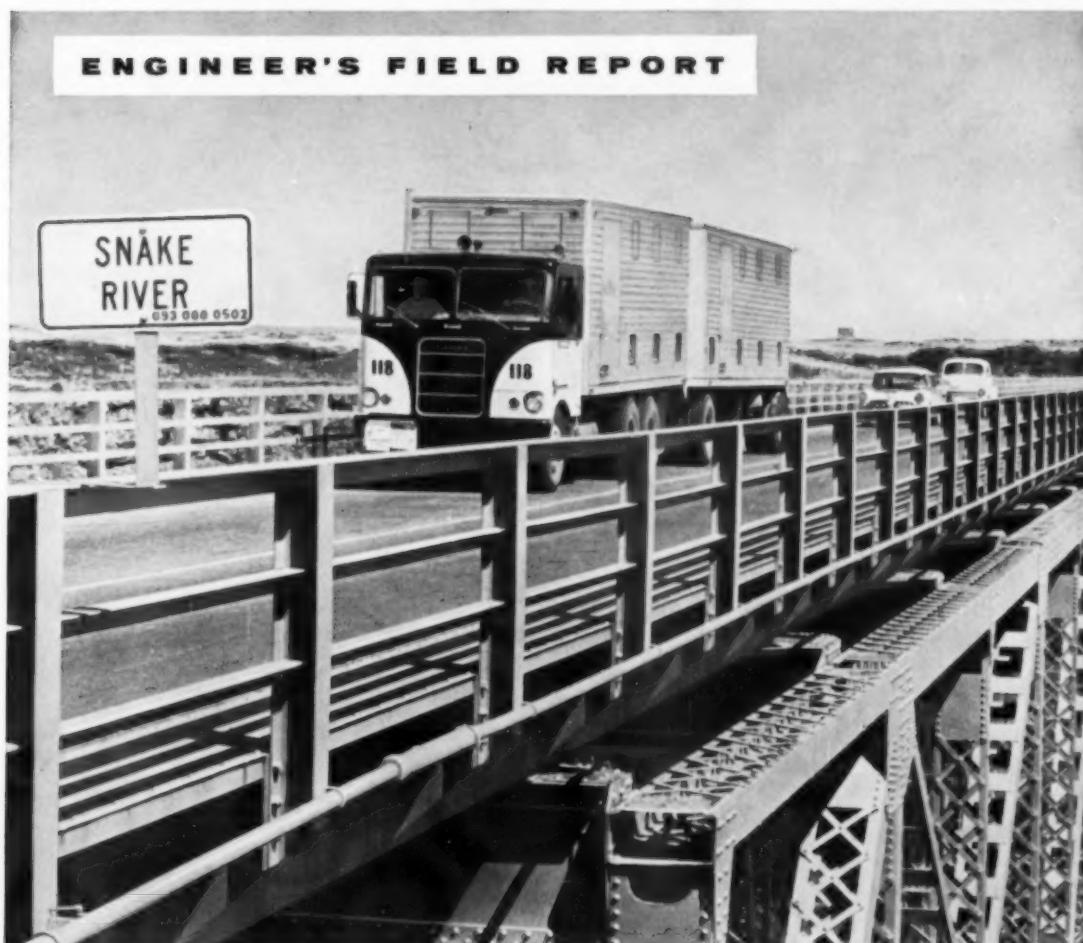
MARINE COUPLINGS
Main Drives
Auxiliary Drives



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ENGINEER'S FIELD REPORT



RPM DELO Special Oil protects so well... trucks work 25% longer before overhaul

Wagner Transportation Co., Twin Falls, Idaho, used to schedule engine overhauls for its over-the-road diesel tractors at 200,000 miles. After changing to RPM DELO Special Oil, however, engines dismantled at this interval showed so little wear . . . were in such good condition throughout . . . that overhaul period was extended to 250,000 miles.

"RPM DELO Special Oil does the best job of any oil we've ever used," says Wagner's Master Mechanic, Ike Rile.

"We've used it since 1952 . . . have yet to find a stuck ring. It holds down engine wear, eliminates sludge and varnish...oil consumption is moderate, too! We've tried competitive oils but in our opinion there's no comparison."

Hauling livestock, produce and general freight, Wagner Transportation Co. rigs operate throughout the West in every sort of temperature extreme . . . travel close to 2½ million miles per year. Present fleet includes 10 Whites and 10 Kenworths.

RPM DELO OIL reduces wear and prolongs engine life because it clings to parts whether the engine is running or idle . . . hot or cold. Piston rings stay free because an anti-oxidant fights gum and lacquer formation and a special detergent keeps parts clean. Other additives prevent corrosion of bearing metal and crankcase foaming.

Why not try RPM DELO Oil? Chances are it can cut your costs, lengthen equipment life. Just call your local representative or write any company listed below:



STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • **STANDARD OIL COMPANY OF TEXAS**, El Paso
CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey - Denver, Colorado

TRADEMARK "RPM DELO" AND CHEVRON DESIGN REG. U.S. PAT. OFF.



R. L. Boyer, Vice President and Director of Engineering, and W. B. Boyum,
Manager of Gas Turbine Sales, The Cooper-Bessemer Corporation report...

World's first jet powered gas turbine is now on the job

You are looking at a revolutionary new concept in industrial power. This Cooper-Bessemer 10,500 hp RT-248 gas turbine with a modified Pratt & Whitney Aircraft J-57 jet engine introduces new, drastic economies in plant construction, operation and maintenance. Shown here on the job at the Clementsville (Kentucky) Compressor Station of

Columbia Gulf Transmission Company, this powerful, compact unit has taken on the total gas-boosting load of the station, operating 'round the clock. Find out how this outstanding joint development of Cooper-Bessemer and Pratt & Whitney Aircraft can fit into your plans for compressors, generators and other rotating machinery. Call our nearest office.

Cooper-Bessemer

GENERAL OFFICES: MOUNT VERNON, OHIO
ENGINES: GAS - DIESEL - GAS-DIESEL
COMPRESSORS: RECIPROCATING AND CENTRIFUGAL
ENGINE TURBINES OR MOTOR DRIVEN

